

AD-A194 015

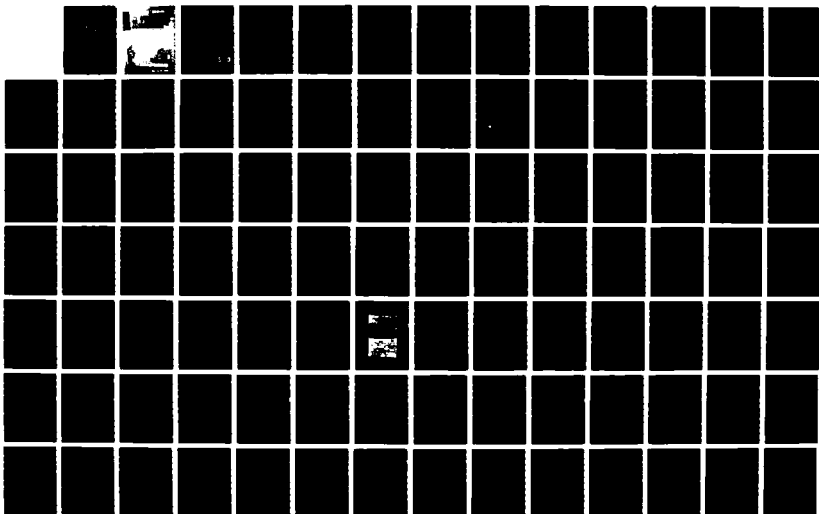
REPORT OF CLASS II SURVEY AND TESTING OF CULTURAL
RESOURCES AT THE NIPP (U) MARIAM ASSOCIATES INC
ALBUQUERQUE NM J C ACKLEN ET AL. MAY 87

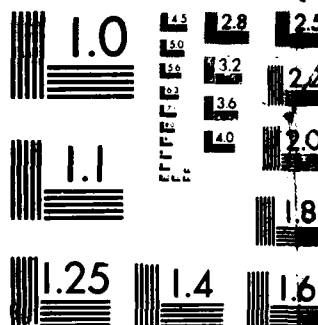
1/3

UNCLASSIFIED

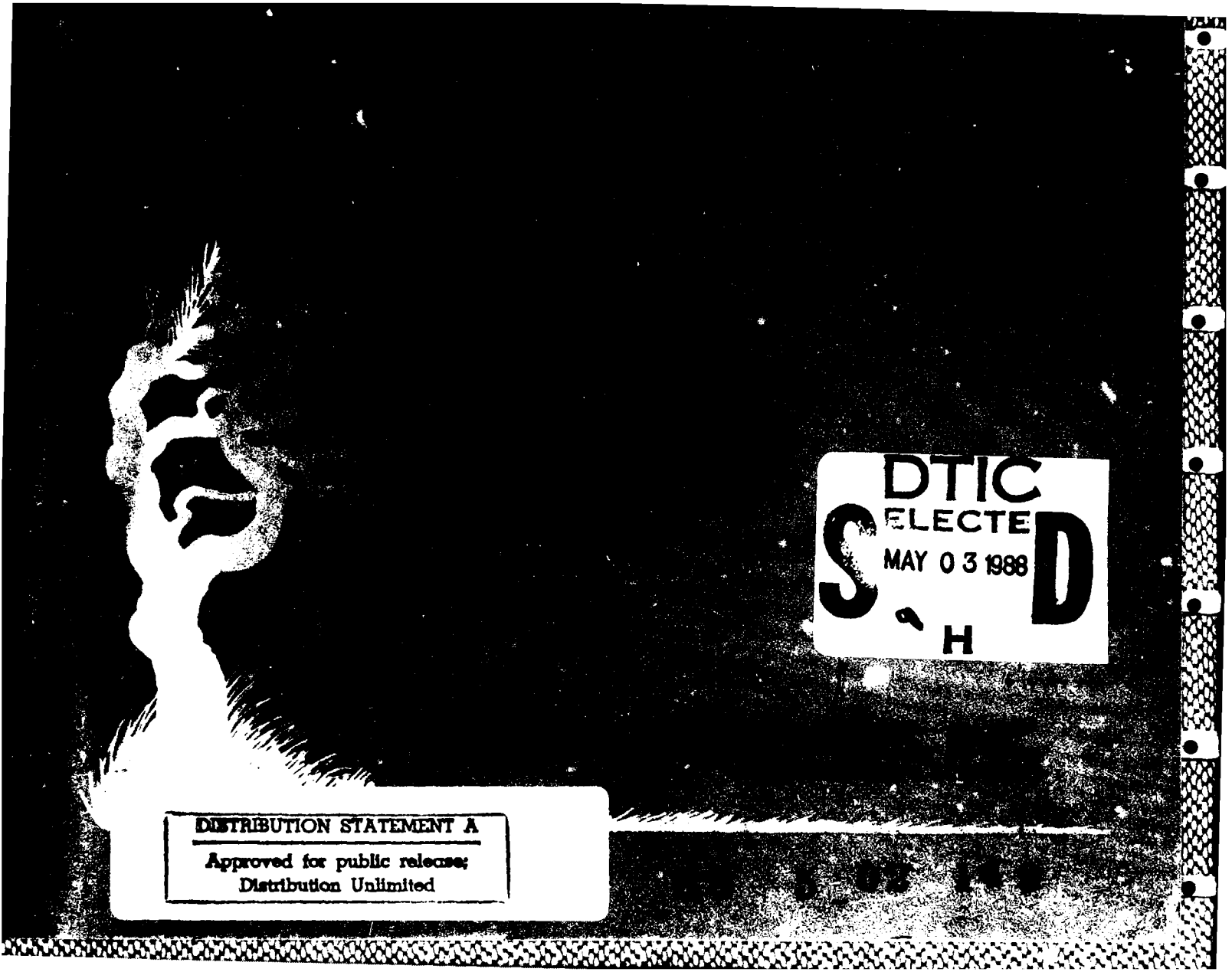
F/G 5/6

NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A



DTIC
ELECTE
MAY 03 1988
S H D

DISTRIBUTION STATEMENT A

Approved for public release;
Distribution Unlimited

2

REPORT OF CLASS II SURVEY AND TESTING
OF CULTURAL RESOURCES AT THE
WIPP SITE AT CARLSBAD, NEW MEXICO

Prepared for

U.S. Army Corps of Engineers
Albuquerque District

DTIC
ELECTE
MAY 03 1988
S D
CH

Prepared by

Mariah Associates, Inc.
Albuquerque, New Mexico

May 1987

DISTRIBUTION STATEMENT A

Approved for public release;
Distribution Unlimited

TABLE OF CONTENTS

| | <u>Page</u> |
|---|-------------|
| 1.0 INTRODUCTION | 1 |
| 2.0 ENVIRONMENTAL CONTEXT | 2 |
| 2.1 GEOLOGY | 2 |
| 2.2 PHYSIOGRAPHY | 2 |
| 2.3 CLIMATE | 2 |
| 2.4 FLORA | 5 |
| 2.5 FAUNA | 6 |
| 3.0 OVERVIEW AND RESEARCH DESIGN | 7 |
| 3.1 CRITIQUE OF CULTURAL RESOURCE KNOWLEDGE IN SOUTHEASTERN NEW MEXICO | 7 |
| 3.1.1 Context and Spatial Limits | 7 |
| 3.1.2 An Overview Synopsis | 8 |
| 3.1.2.1 PaleoIndian Period | 8 |
| 3.1.2.2 Late PaleoIndian/Earlier Archaic Period | 10 |
| 3.1.3 Historical Bases for Prehistoric Chronology ... | 12 |
| 3.1.4 Paleoclimate and Culture | 14 |
| 3.1.5 Deposition and Soil Dynamics | 15 |
| 3.1.6 Absolute Chronology in Southeastern New Mexico. | 16 |
| 3.1.7 Summary | 19 |
| 3.2 RESEARCH PROBLEMS | 20 |
| 3.2.1 The Prehistoric Period | 20 |
| 3.2.2 The Historical Period | 21 |
| 3.3 THE RESEARCH DESIGN | 23 |
| 3.4 OPERATIONALIZING THE RESEARCH DESIGN | 24 |
| 3.4.1 Survey Sampling Methodology | 24 |
| 3.4.1.1 Sampling Methodology - Zones III and IV | 24 |
| 4.0 SURVEY DESCRIPTION | 30 |
| 4.1 INTRODUCTION | 30 |
| 4.2 SURVEY COVERAGE | 30 |
| 4.3 DEFINITION OF SITES AND ISOLATED OCCURRENCES | 30 |
| 4.4 RECORDING | 31 |
| 4.4.1 Recording of Isolated Occurrences | 31 |
| 4.4.2 Recording of Archaeological Sites | 31 |
| 4.5 CREW COMPOSITION AND TIME EXPENDED | 33 |

on For

RA&I

B

nced

ation

31

per HP

31

ution/

bility Codes

ail and/or

Special

Dist

A-1



TABLE OF CONTENTS (continued)

| | <u>Page</u> |
|---|-------------|
| 5.0 SURVEY RESULTS | 35 |
| 5.1 INTRODUCTION | 35 |
| 5.2 SITE DESCRIPTIONS | 35 |
| 5.2.1 Site: MA-235B-1; LA 54357 | 35 |
| 5.2.2 Site: MA-235B-2; LA 54358 | 36 |
| 5.2.3 Site: MA-235B-3; LA 54359 | 37 |
| 5.2.4 Site: MA-325B-4; LA 53460 | 37 |
| 5.2.5 Site: MA-234B-5; LA 54361 | 38 |
| 5.2.6 Site: MA-235B-6; LA 54362 | 39 |
| 5.2.7 Site: MA-235B-7; LA 54363 | 41 |
| 5.2.8 Site: MA-234B-8; LA 54364 | 45 |
| 5.2.9 Site: MA-235B-9; LA 54365 | 45 |
| 5.2.10 Site: MA-235B-10; LA 54366 | 47 |
| 5.2.11 Site: MA-235B-11; LA 54367 | 49 |
| 5.2.12 Site: MA-235B-12; LA 54368 | 50 |
| 5.2.13 Site: MA-235B-13; LA 54369 | 52 |
| 5.2.14 Site: MA-234B-14; LA 54370 | 53 |
| 5.2.15 Site: MA-235B-15; LA 54371 | 54 |
| 5.2.16 Site: MA-235B-16; LA 54372 | 54 |
| 5.2.17 Site: MA-235B-17; LA 54373 | 55 |
| 5.2.18 Site: MA-235B-18; LA 54374 | 57 |
| 5.2.19 Site: MA-235B-19; LA 54375 | 59 |
| 5.2.20 Site: MA-235B-20; LA 54376 | 62 |
| 5.2.21 Site: MA-235B-21; LA 54377 | 63 |
| 5.2.22 Site: MA-235B-22; LA 54378 | 64 |
| 5.2.23 Site: MA-235B-23; LA 54379 | 65 |
| 5.2.24 Site: MA-235B-24; LA 54380 | 65 |
| 5.2.25 Site: MA-235B-25; LA 54381 | 67 |
| 5.2.26 Site: MA-235B-26; LA 54382 | 68 |
| 5.2.27 Site: MA-235B-27; LA 54383 | 69 |
| 5.2.28 Site: MA-235B-28; LA 54384 | 70 |
| 5.2.29 Site: MA-235B-29; LA 54385 | 71 |
| 5.2.30 Site: MA-235B-30; LA 54386 | 73 |
| 5.2.31 Site: MA-235B-31; LA 54387 | 73 |
| 5.2.32 Site: MA-235B-32; LA 54388 | 74 |
| 5.2.33 Site: MA-235B-33; LA 54389 | 76 |
| 5.2.34 Site: MA-235B-34; LA 54390 | 78 |
| 5.2.35 Site: MA-235B-35; LA 54391 | 80 |
| 5.2.36 Site: MA-235B-36; LA 54392 | 81 |
| 5.2.37 Site: MA-235B-37; LA 54393 | 82 |
| 5.2.38 Site: MA-235B-38; LA 54394 | 83 |
| 5.2.39 Site: MA-235B-39; LA 54395 | 85 |
| 5.2.40 Site: MA-235B-40; LA 54396 | 86 |
| 5.2.41 Site: LA 16633 (ENM 10408) | 86 |
| 5.3 ISOLATED OCCURRENCES | 86 |

TABLE OF CONTENTS (continued)

| | <u>Page</u> |
|--|-------------|
| 5.4 SURVEY SUMMARY | 92 |
| 5.4.1 Surface Lithic Artifact Summary | 92 |
| 5.4.1.1 Debitage | 92 |
| 5.4.1.2 Tools | 92 |
| 5.4.1.3 Groundstone | 99 |
| 5.4.1.4 Material Type | 100 |
| 5.4.1.5 Lithic Sources | 100 |
| 5.4.1.6 Technology | 101 |
| 5.4.1.7 Site Size | 102 |
| 5.4.1.8 Sites with Interesting Lithic Assemblages | 104 |
| 5.4.2 Ceramic Analysis Summary | 104 |
| 5.4.2.1 Design of Ceramic Analysis | 105 |
| 5.4.2.2 K-means Cluster on Surface Variables | 107 |
| 5.4.2.3 K-means Cluster on Temper Variables | 110 |
| 5.4.2.4 Additional Ceramic Attributes | 112 |
| 5.4.2.5 Overall Ceramic Summary | 112 |
| 6.0 TESTING PHASE | 114 |
| 6.1 Testing Strategies and Procedures | 114 |
| 6.2 Testing Results | 117 |
| 6.2.1 LA 54388/MA 235B-32 | 117 |
| 6.2.2 LA 54363/MA 235B-7 | 123 |
| 6.2.3 LA 54389/MA 235B-33 | 130 |
| 6.2.4 LA 54374/MA 235B-18 | 130 |
| 6.2.5 LA 54364/MA 235B-8 | 130 |
| 6.2.6 LA 54366/MA 235B-10 | 131 |
| 6.2.7 LA 54375/MA 235B-19 | 131 |
| 6.2.8 LA 54385/MA 235B-29 | 132 |
| 6.2.9 LA 54368/MA 235B-12 | 132 |
| 6.2.10 LA 54373/MA 235B-17 | 132 |
| 6.2.11 LA 54380/MA 235B-24 | 132 |
| 6.3 Testing Summary | 133 |
| 7.0 ARCHAEOLOGICAL INTERVIEWS | 134 |
| 7.1 INTRODUCTION | 134 |
| 7.2 FACTORS AFFECTING THE CHANGING VISIBILITY AND INTEGRITY OF ARCHAEOLOGICAL RESOURCES IN THE WIPP PROJECT VICINITY | 134 |
| 7.2.1 Environmental Changes | 134 |
| 7.2.2 Changing Activities of Amateur Collectors | 135 |

TABLE OF CONTENTS (continued)

| | <u>Page</u> |
|--|-------------|
| 7.3 THE COLLECTIONS | 136 |
| 7.3.1 Projectile Point Typology | 136 |
| 7.3.2 Locally Collected Point Types | 137 |
| 7.3.2.1 Locally Collected Point Types | 137 |
| 7.3.2.2 Archaic | 137 |
| 7.3.2.3 Ceramic | 139 |
| 7.3.3 Ceramic Artifacts | 141 |
| 7.3.4 Other Chipped Stone | 141 |
| 7.3.5 Groundstone | 141 |
| 7.3.6 Possible Hoes | 141 |
| 7.4 Site Characteristics | 141 |
| 7.5 Conclusions | 142 |
| 8.0 LAND USE IN THE CARLSBAD AREA [AD 1582 1945] | 143 |
| 8.1 INTRODUCTION | 143 |
| 8.2 APACHE LAND USE | 152 |
| 8.2.1 The Pecos River Environment at European Contact 1852 | 152 |
| 8.2.2 Seventeenth Century Trade Relations | 154 |
| 8.2.3 Comanche Influence on the Apache, Spanish, and Pueblo Relationships | 156 |
| 8.2.4 The San Saba Mission Accounts of the Southern Apache 1763 | 156 |
| 8.2.5 Don Antonio Cordero's Account of the Southern Apache 1796 | 157 |
| 8.3 CIBOLEROS AND COMANCHEROS 1786-1878 | 158 |
| 8.3.1 Comanchero Activities 1786-1878 | 159 |
| 8.4 NEW MEXICAN HISPANIC MOVEMENT INTO THE HONDO VALLEY ... | 160 |
| 8.5 ECONOMIC DEVELOPMENT OF THE LOWER PECOS VALLEY BY ANGLOS | 161 |
| 8.5.1 The Expansion of Cattle Ranching to the Llano .. | 163 |
| 8.5.2 Anglo-American Homesteading | 166 |
| 8.5.3 Effects of Land Use on Environment | 167 |
| 8.6 MEXICAN-AMERICAN SETTLEMENT IN THE LOWER PECOS VALLEY . | 167 |
| 8.7 SUMMARY | 169 |
| 8.8 HISTORICAL PERIOD USE OF THE CARLSBAD AREA | 170 |
| 8.9 EVALUATION OF HISTORICAL SITES LOCATED IN DOCUMENTS ... | 172 |

TABLE OF CONTENTS (continued)

| | <u>Page</u> |
|---|-------------|
| 9.0 SUMMARY AND DISCUSSION | 174 |
| 9.1 SUMMARY..... | 174 |
| 9.2 DISCUSSION | 178 |
| 10.0 MANAGEMENT RECOMMENDATIONS | 183 |
| 10.1 PROBABLE IMPACTS | 183 |
| 10.2 PROTECTIVE MEASURES | 183 |
| 10.3 ELIGIBILITY OF IDENTIFIED CULTURAL RESOURCES | 183 |
| 10.4 RESOURCE POTENTIAL FOR DATA RECOVERY | 189 |
| 10.4.1 Sites with Sufficient Data for Assessment of Potential | 189 |
| 10.4.1.1 PaleoIndian or Earlier Archaic Sites | 189 |
| 10.4.1.2 Archaic Sites | 189 |
| 10.4.1.3 Mogollon Sites | 192 |
| 10.4.2 Sites with Insufficient Data for Complete Assessment of Potential | 192 |
| 10.4.2.1 Archaic Sites | 192 |
| 10.4.2.2 Mogollon Sites | 192 |
| 10.4.2.3 Sites of Unknown Age | 193 |
| 10.5 DATA RECOVERY STRATEGIES | 193 |
| 10.5.1 Methodological Considerations | 193 |
| 10.5.2 Recommended Data Recovery Strategies | 194 |
| 11.0 LITERATURE CITED | 199 |

LIST OF FIGURES

| | <u>Page</u> |
|---|-------------|
| Figure 2.1 Eddy, Lea, and Chaves Counties, New Mexico, WIPP Assessment Study, ACOE, 1986 | 3 |
| Figure 2.2 Project Map, WIPP Assessment Study, ACOE, 1986 | 4 |
| Figure 3.1 New Mexico - Texas - Mexico Regional Map, WIPP Assessment Study, ACOE, 1986 | 9 |
| Figure 5.1 MA235B-6/LA 54362, WIPP Assessment Study, ACOE, 1986 | 40 |
| Figure 5.2 MA235B-7/LA 54363, WIPP Assessment Study, ACOE, 1986 | 42 |
| Figure 5.3 Artifact Density on LA 54363; All Visible Objects are Either Artifactual or Thermofactual (photo), WIPP Assessment Study, ACOE, 1986 | 43 |
| Figure 5.4 Caliche Surface Alignments on LA 54363 (photo), WIPP Assessment Study, ACOE, 1986 | 43 |
| Figure 5.5 MA235B-8/LA 54364, WIPP Assessment Study, ACOE, 1986 | 46 |
| Figure 5.6 MA235B-10/LA 54366, WIPP Assessment Study, ACOE, 1986 | 48 |
| Figure 5.7 MA235B-12/LA 54368, WIPP Assessment Study, ACOE, 1986 | 51 |
| Figure 5.8 MA235B-17/LA 54373, WIPP Assessment Study, ACOE, 1986 | 56 |
| Figure 5.9 MA235-18/LA 54374, WIPP Assessment Study, ACOE, 1986 | 58 |
| Figure 5.10 MA235B-19/LA 54375, WIPP Assessment Study, ACOE, 1986 | 60 |
| Figure 5.11 MA235B-24/LA 54380, WIPP Assessment Study, ACOE, 1986 | 66 |
| Figure 5.12 MA235B-29/LA 54385, WIPP Assessment Study, ACOE, 1986 | 72 |
| Figure 5.13 MA235B-32/LA 54388, WIPP Assessment Study, ACOE, 1986 | 75 |
| Figure 5.14 MA235B-33/LA 54389, WIPP Assessment Study, ACOE, 1986 | 77 |
| Figure 5.15 MA235B-34/LA 54390, WIPP Assessment Study, ACOE, 1986 | 79 |
| Figure 5.16 MA235B-38/LA 54394, WIPP Assessment Study, ACOE, 1986 | 84 |
| Figure 5.17 Site Lithic Artifact Density and Number of Artifact Classes, WIPP Assessment Study, ACOE, 1986 | 103 |
| Figure 5.18 Ochoa Brown Indented Jar Rim Sherd, LA 54360, WIPP Assessment Study, ACOE, 1986 | 109 |

LIST OF FIGURES (continued)

| | <u>Page</u> |
|---|-------------|
| Figure 6.1 Plan and Profile of Hearth Feature 1, LA 54388, WIPP Assessment Study, ACOE, 1986 | 119 |
| Figure 6.2 Feature 1 Before Excavation, LA 54388 (photo), WIPP Assessment Study, ACOE, 1986 | 119 |
| Figure 6.3 Test Pit 1 After Excavation, LA 54388 (photo), WIPP Assessment Study, ACOE, 1986 | 119 |
| Figure 6.4 South Wall Profile of Test Pit 4, LA 54388, WIPP Assessment Study, ACOE, 1986 | 121 |
| Figure 6.5 East Wall Profile of Test Pit 4, LA 54388, WIPP Assessment Study, ACOE, 1986 | 122 |
| Figure 6.6 Plan of Surface Caliche Alignments, LA 54363, WIPP Assessment Study, ACOE, 1986 | 124 |
| Figure 6.7 North Wall Profile of Test Pit 1, LA 54363, WIPP Assessment Study, ACOE, 1986 | 125 |
| Figure 6.8 Test Pit 1 Caliche Rubble, LA 54363 (photo), WIPP Assessment Study, ACOE, 1986 | 126 |
| Figure 6.9 Test Pit 1 After Completion, LA 54363 (photo), WIPP Assessment Study, ACOE, 1986 | 126 |

LIST OF FIGURES (continued)

| | <u>Page</u> |
|---|-------------|
| Figure 6.10 Subsurface Cross-sections Based on Auger Test Transect 1, LA54363, WIPP Assessment Study, ACOE, 1986 | 128 |
| Figure 6.11 Subsurface Cross-sections Bases on Auger Test Transect 2, LA 54363, WIPP Assessment Study, ACOE, 1986 | 129 |
| Figure 7.1 PaleoIndian Points from the Crooks Collection (photo), WIPP Assessment Study, ACOE, 1986 | 138 |
| Figure 7.2 Points from the Hicks Collection, Most Collected from the Carlsbad Area (photo), WIPP Assessment Study, ACOE, 1986 | 140 |
| Figure 9.1 LA 54384, Located on a Stablized Dune Ridge, WIPP Assessment Study, ACOE, 1986 | 175 |
| Figure 9.2 LA 54378, Located in an Active Blowout on a Dune, Ridge (photo), WIPP Assessment Study, ACOE, 1986 | 175 |
| Figure 9.3 LA 54373, Located on a Low Rise Overlooking a Playa, WIPP Assessment Study, ACOE, 1986 | 176 |
| Figure 9.4 Stacked Rock Hearth, LA 54364 (photo), WIPP Assessment Study, ACOE, 1986 | 176 |
| Figure 9.5 LA 54376, Undergoing Erosion from Small Washes, WIPP Assessment Study, ACOE, 1986 | 179 |
| Figure 9.6 The Los Medanos Dune Field, WIPP Assessment Study, ACOE, 1986 | 179 |

LIST OF TABLES

| | <u>Page</u> |
|---|-------------|
| Table 3.1 Jornada Mogollon Sequences, WIPP Assessment Study, ACOE, 1986 | 13 |
| Table 3.2 Summary of Prehistoric Research Problems, WIPP Site, WIPP Assessment Study, ACOE, 1986 | 24 |
| Table 3.3 Number of Units by Type and Size, WIPP Assessment Study, ACOE, 1986 | 26 |
| Table 3.4 Resulting Sample Fractions, WIPP Assessment Study, ACOE, 1986 | 27 |
| Table 3.5 Sample Results, WIPP Zones III and IV, WIPP Assessment Study, ACOE, 1986 | 28 |
| Table 3.6 Sample Results, WIPP Zone V, WIPP Assessment Study, ACOE, 1986 | 29 |
| Table 5.1 Isolated Occurrence Description by Landform, WIPP Assessment Study, ACOE, 1986 | 87 |
| Table 5.2 Isolated Occurrences -- Grouped Physiographic Settings, WIPP Assessment Study, ACOE, 1986 | 91 |
| Table 5.3 Lithic Artifact Types by Site, WIPP Assessment Study, ACOE, 1986 | 93 |
| Table 5.4 Reduction by Site, WIPP Assessment Study, ACOE, 1986. | 95 |
| Table 5.5 Utilization and Marginal Retouch on Debitage (Flakes and Angular Debris), WIPP Assessment Study, ACOE, 1986 | 97 |
| Table 5.6 Thickness of Complete Flakes by Site, WIPP Assessment Study, ACOE, 1986 | 98 |
| Table 5.7 Ceramic Types by Site, WIPP Assessment Study, ACOE, 1986 | 106 |
| Table 5.8 Ceramic Clusters on Surface Treatment/Paste/Form Variables, WIPP Assessment Study, ACOE, 1986 | 108 |
| Table 5.9 Ceramic Clusters on Temper Variable, WIPP Assessment Study, ACOE, 1986 | 111 |
| Table 6.1 Testing Priorities and Effort Expended, WIPP Assessment Study, ACOE, 1986 | 115 |
| Table 6.2 LA 54388 C-14 Dates, WIPP Assessment Study, ACOE, 1986 | 117 |

LIST OF TABLES (continued)

| | <u>Page</u> |
|---|-------------|
| Table 8.1 Historical Overview of the Carlsbad Vicinity, WIPP Assessment Study, ACOE, 1986 | 144 |
| Table 10.1 Site Type, Integrity, and Significance, WIPP Assessment Study, ACOE, 1986 | 184 |
| Table 10.2 Significance and Potential for Future Research, WIPP Assessment Study, ACOE, 1986 | 190 |

LIST OF APPENDICES

- APPENDIX A: Forms For In-Field Artifact Analysis and Test Excavations In
the WIPP Study
- APPENDIX B: Collected Lithic Tools
- APPENDIX C: Lithic Tables
- APPENDIX D: Flotation and Charcoal Analyses from two Small Sites

7111

ABSTRACT

In September of 1985, the Army Corps of Engineers, Albuquerque District, contracted Mariah Associates, Inc. to conduct a Class II cultural resource survey of approximately 3,100 acres in WIPP Zones III, IV, and V in Eddy County, New Mexico. A total of 40 archaeological sites was located; 11 were subsequently tested. Sites included probable PaleoIndian, Archaic, Mogollon, and Protohistoric camps. Seventy-five isolated artifacts were recorded. Ancillary studies included archaeological and historical interviews and archival research.

Site-specific recommendations concerning eligibility to the National Register of Historic Places are made and recommendations for future work in the project area are advanced.

cont'd pg XVI

XNY

77

ACKNOWLEDGEMENTS

Work in the Carlsbad area would not have been possible without the assistance of many people. Dan Landis, John Montgomery, Phil Shelley and Stewart Byous provided useful information. Linda Brett was BLM Archaeologist and helped with the archaeological interviews. The Laboratory of Anthropology checked their site records for previously recorded sites. Harvey Hicks and Dr. Charles Crook provided essential information for the archaeological interviews section.

People who provided historical information were Mr. and Mrs. Kenny Smith, Mr. and Mrs. Charles James, Green London, Mrs. Ruth Pue, Huling Ussery, Ray Anaya, Antonio Carasio, Mr. Acosta, and Father Noel Krammer. Local historians consulted were Bill Balgeman, Josephine Hendley, and Leland C. Myers.

The work was directed by John C. Acklen and Jack B. Bertram, who shared service as Principal Investigator and Field Director. Field crew for the project included Acklen and Bertram; James Enloe and Jon Frizell served as crew chiefs; and Amy Earls, Steven Hoagland, Karen Kramer, and Dave McGuire served as crew members. Suzette McCord acted as project historian.

Ceramic laboratory analysis and reporting were carried out by Earls, with aid from Bertram. Kramer performed general lithic analysis and reporting with help from Bertram and McGuire. Acklen handled archaeological interviews, with the assistance of Linda Brett. Earls and Bertram wrote site descriptions and isolate summaries. Acklen wrote testing descriptions and archaeological interviews sections. Bertram and later Earls assumed overall responsibility for report coordination. Bertram wrote sections 1.0, 3.0, and 9.0; Earls wrote sections 2.0 and 10.0. Earls and Bertram edited and compiled the report. Earls revised sections 3.0, 5.0, 7.0, and 8.0. Peggy Burkett, Virginia Hula, Man Lu, Louella Chavez, and Joann Oliver typed the manuscript and the manuscript assemblage was done by Joann Oliver. Final revisions were made by Nancy Cochran. Site and regional maps were drawn by Colin Garvey and Roman Fojud. Fojud prepared artifact illustrations.

2VI

MANAGEMENT SUMMARY

Results of a Class II cultural resources survey and limited testing program on sites in the WIPP area in Eddy County near Carlsbad, New Mexico are reported.

Forty sites were recorded. Fourteen of these are considered definitely eligible and 24 sites are considered potentially eligible for nomination to the National Register of Historic Places. Present and potential impacts to these 38 sites are described. The sites are grouped and ranked according to research potential; data recovery strategies are detailed, also.

The manager should note that included are two very large multicomponent sites, a possible PaleoIndian site, a single component Mogollon site, and five significant sites with high site integrity. All site categories are subject to more than one adverse impact, and data collection strategies differ greatly for each category. Should total avoidance prove infeasible, extensive data collection would be required.

1.0 INTRODUCTION

This report is submitted in fulfillment of Delivery Order No. DM0003 under Contract No. DACW47-85-D-0030 and its amendments, awarded to Mariah Associates, Inc., by the Albuquerque District of the U.S. Army Corps of Engineers. The report describes archaeological and historical studies carried out in the course of a Class II cultural resources inventory survey of areas to be impacted (Zones III and IV) or exchanged (Zone V) in the course of ongoing operation of the Waste Isolation Pilot Plant Project near Carlsbad, New Mexico.

The work was directed by John C. Acklen and Jack B. Bertram, who shared service as Principal Investigator and Field Director. Archaeological field work began in November, 1985, and was concluded in March, 1986. Historical field work was conducted in November, December and January.

Field crew for the project included Acklen and Bertram; James Enloe and Jon Frizell served as crew chiefs; and Amy Earls, Steven Hoagland, Karen Kramer and Dave McGuire served as crew members. Suzette McCord acted as project historian.

Ceramic laboratory analysis and reporting were carried out by Earls, with aid from Bertram. Kramer performed general lithic analysis and reporting with help from Bertram and McGuire. Acklen handled archaeological interviews, with the assistance of Linda Brett. Earls and Bertram wrote site descriptions and isolate summaries. Acklen wrote testing descriptions and archaeological interviews sections. Bertram and later Earls assumed overall responsibility for report coordination. Bertram wrote sections 1.0, 3.0, and 9.0; Earls wrote sections 2.0 and 10.0. Earls and Bertram edited and compiled the report. Earls revised sections 3.0, 5.0, 7.0, and 8.0. Peggy Burkett, Virginia Hula, Man Lu, and Joann Oliver types and assembled the manuscript. Site and regional maps were drawn by Colin Garvey and Roman Fojud. Fojud prepared artifact illustrations.

This report is organized in an order mirroring the actual schedule of research: Section 2 presents the environmental context of research; Section 3 details the intellectual and scientific context; Sections 4 and 5 detail the Class survey carried out; Section 6 discusses the limited testing accomplished; Sections 7 and 8 discuss informant-based and archive-based data, while Sections 9 and 10 detail results, conclusions, and recommendations.

2.0 ENVIRONMENTAL CONTEXT

The project area is in southeastern New Mexico (Figure 2.1), in Eddy County near Carlsbad. The area is entirely included within T22S, R31E: sections 1, 5, 7, 9, 10, 15, 19, 20, 22, 23, 30, 32, 33, 34, 35; T22S, R30E: Section 24; T23S, R31E: Section 4; and T21S, R31E: Sections 23 and 35 (Figure 2.2). These sections include land to be impacted by access road construction and other activities relating to operation of the waste isolation plant.

2.1 GEOLOGY

The project area lies in the Pecos Valley portion of the southern Great Plains physiographic province, a broad highland belt sloping eastward and intermediate in location between the Rocky Mountains and Basin and Range Province and the Central Lowlands Province. The Pecos Valley section contains the long north-south trough of the Pecos River, which has an uneven rock- and alluvium-covered floor with numerous solution-subsidence features resulting from dissolution in the underlying Permian rocks. To the east of the Pecos Valley section is the Mescalero Escarpment, sloping up to the northeast onto the Llano Estacado, a poorly drained eastward sloping surface covered with Tertiary sands, gravels, silts and caliche; at the present ground surface is the Ogallallah Formation (Leslie 1979:183; U.S. Department of Energy 1980:7-21-7-23). Triassic strata are exposed in small sinks and playas, red clay flats, and sandstone ridges. These comprise the area's best water sources outside of springs along the caprock and freshwater lakes (Leslie 1979:185).

2.2 PHYSIOGRAPHY

The land surface in the project area is a windblown plain sloping gently from 1088 m (3570 feet) in the east to 990 m (3250 feet) in the west. The generally thin topsoil, sand ridges and dunes at the surface are underlain by a hard caliche layer. Surface drainage is intermittent; the Pecos River accepts most of the surface and subsurface drainage. The area contains many small ephemeral lakes, sinks, and draws (Leslie 1979:185). Major geomorphic components, in addition to the river drainage, are the Mescalero plain, karst terrain, and wind erosion dune blowouts (U.S. Department of Energy 1980:7-23, 7-27-7-29).

2.3 CLIMATE

The area's climate is semiarid, exhibiting generally mild temperatures, low precipitation averaging 280 to 330 mm (11 to 13 inches) annually, and moderate winds dominantly from the southwest. Strong west winds and dust storms occur in late winter and spring. Precipitation is lowest in winter and greatest from June to September (U.S. Department of Energy 1980:7-3). The growing season averages 200 to 220 days (Cordell 1979:Map 3).

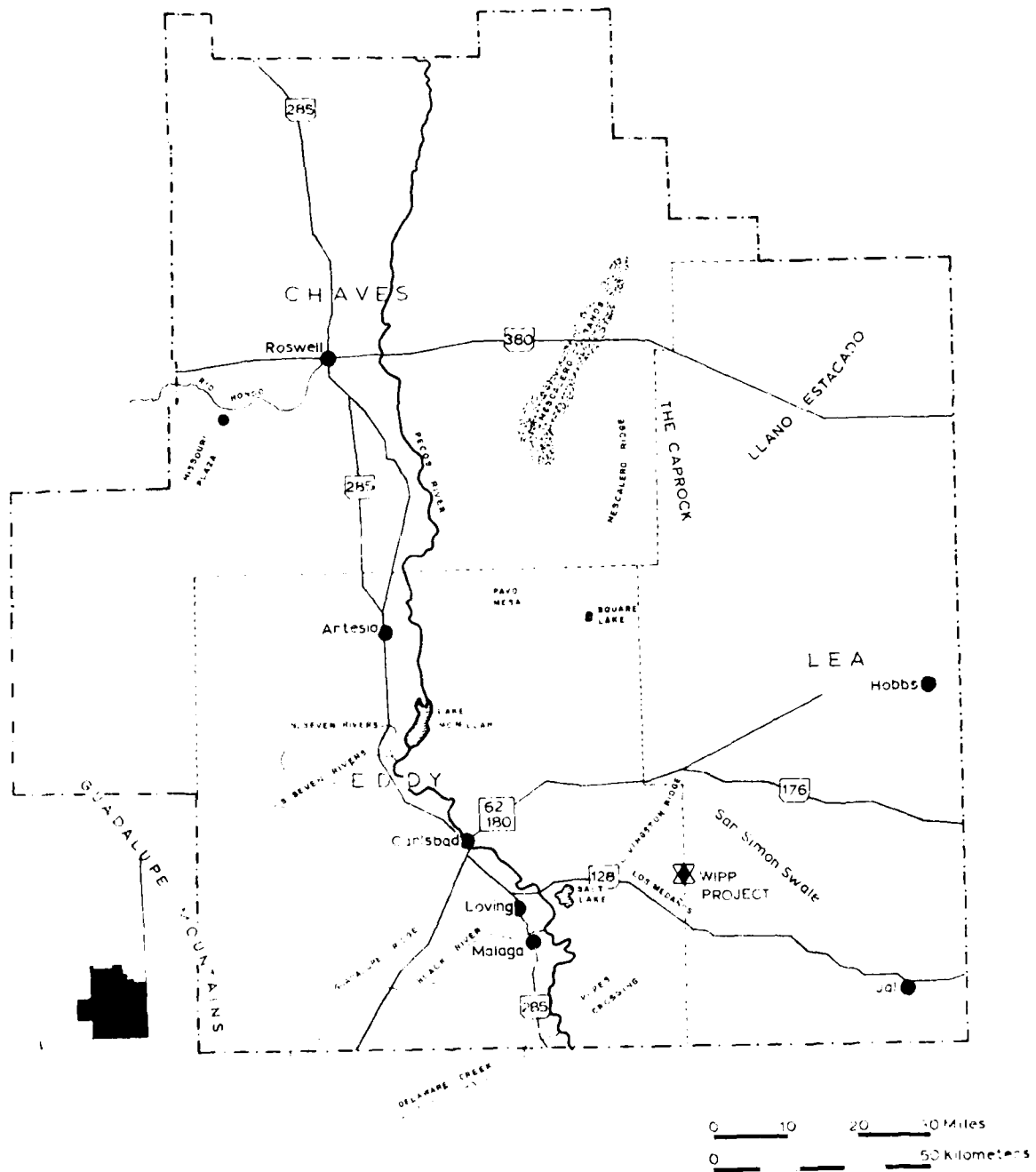


Figure 2.1 Eddy, Lea, And Chaves Counties, New Mexico, WIPP Assessment Study, ACOE, 1986.

PROJECT AREA AND RECORDING LOCATIONS
CLASSIFICATION OF WORK TONES
3.4 (b) S. ACCESSION

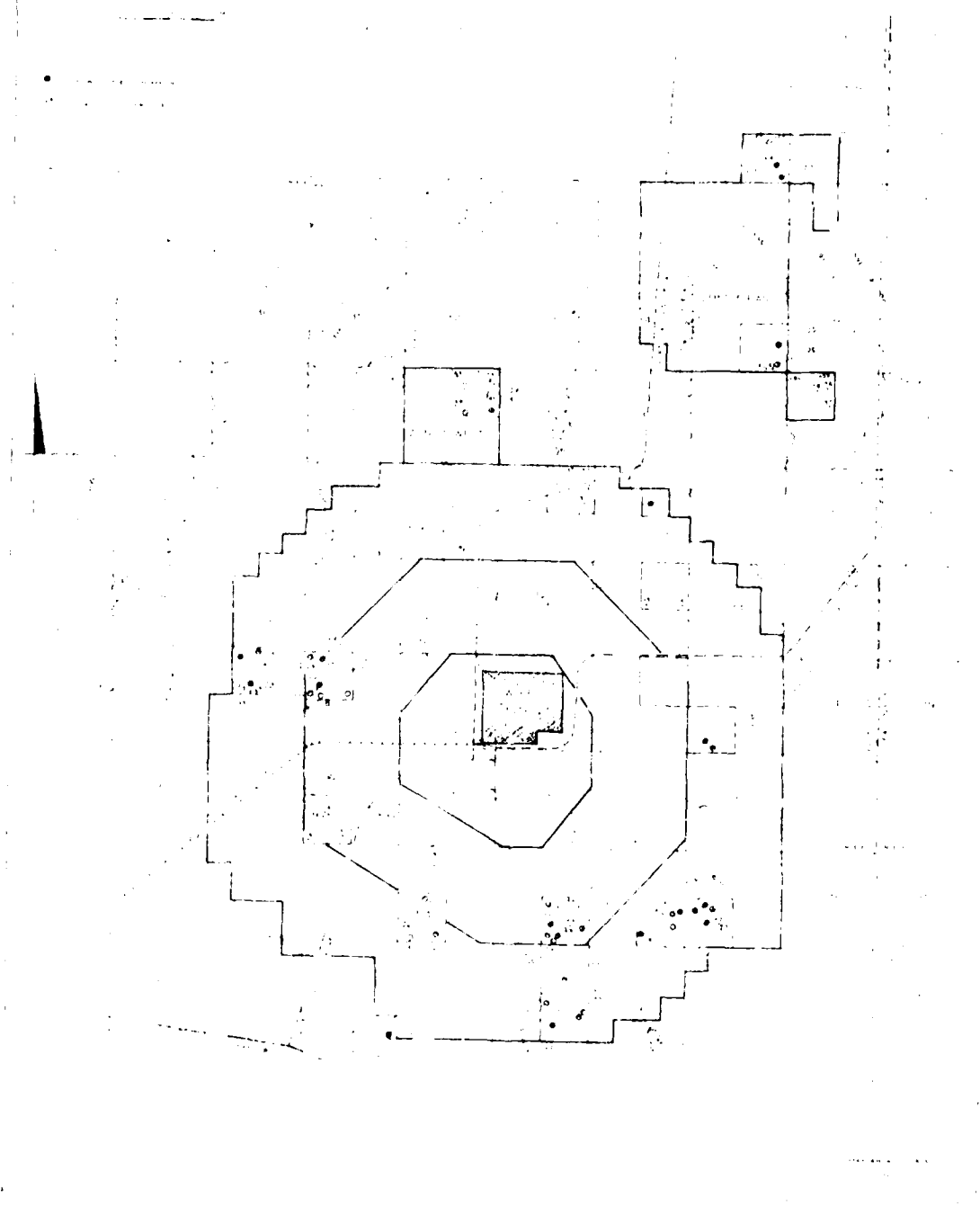


Figure 2.2 Project Map, WIPP Assessment Study, ACOE, 1986.

2.4 FLORA

The project area is in a transitional zone between Chihuahuan Desert (desert grassland) to the south and the southern Great Plains (Short Grass Prairie) to the north. Floral communities are largely determined by grazing pressure, elevation, soil type and depth, aspect, available water, presence and depth of caliche, and fire frequency.

Important fluctuations in the abundance and distribution of plants and wildlife are related to precipitation abundance and grazing pressure. Mesquite, which is common on the western boundaries of the project area, has spread from its original patchy distribution on shallow sandy soils, breaks on drainage edges, and on top of prehistoric sites. Much of the area today is dominated by shin oak (*Quercus havardii*), which extends northward to the Roswell area and south to the southeastern state borders. Its eastward spread has been checked by the Llano Estacado caprock, and its westward spread may have been halted by competition from mesquite. At the time of Anglo-American surveys 75-100 years ago, before extensive grazing, shin oak's extent was more restricted (York and Dick-Peddie 1969:162, 164, 165).

The mesa or mesquite grassland association is located on the Divide, a low mesa on the eastern portion of the project area. Honey mesquite (*Prosopis glandulosa*) is the dominant shrub and snakeweed (*Gutierrezia sarothrae*) the dominant subshrub. Important grasses are black grama (*Bouteloua eriopoda*), bush muhly (*Muhlenbergia porteri*), ring muhly (*Muhlenbergia torreyi*), and fluffgrass (*Eriodens pulchellus*). Various varieties of cactus, particularly prickly pear (*Opuntia* sp.), are present (U.S. Department of Energy 1980:7-4).

The central dune zone contains deep and sandy soil with dominant shrubs of shin oak (*Q. havardii*), honey mesquite, sand sagebrush (*Artemisia filifolia*), snakeweed and dune yucca (*Yucca campestris*) on stabilized dunes. The patchy distribution of these shrubs depends on local variation in the type and depth of soil. Islands or hummocks of vegetation, primarily mesquite, which is less susceptible to aeolian erosion, are surrounded by blowouts of bare sand. Large active dune fields are present at Los Medanos and elsewhere (U.S. Department of Energy 1980:7-4). Grasses found in the stabilized dune area are purple three-awn (*Aristida purpurea*), red three-awn (*Aristida longiseta*), sand dropseed (*Sporobolus cryptandrus*), giant dropseed (*S. giganteus*), black grama, hairy grama (*Bouteloua hirsuta*), and fall witchgrass (*Leptoloma cognatum*). Sandy areas contain sandbur (*Cenchrus* sp.). False buffalograss (*Munroa squarrosa*) occurs in dense concentrations in the spring and early summer of moist years. The oak-mesquite hummock areas differ from the stabilized dune areas primarily in their island-like appearance. The active dunes contain Western soapberry (*Sapindus drummondii*), dune reverchonnia (*Reverchonnia arenaria*), snowball sand verbena (*Abronia fragrans*), and species of the genus *Proboscidea* (unicornplant) (Schander 1985:39-40).

The creosote flats are west and southeast of the central dune area. Soil is denser and shallower (less than 25 cm to caliche) than in the dune area. Creosote bush (*Larrea tridentata*) is the dominant shrub and snakeweed the dominant subshrub. *Muhlenbergia* species occur, as do black grama and purple three-awn. Mesquite occasionally occurs in depressions (Schander 1985:40).

The Livingston Ridge area, between the WIPP site and Nash Draw, features mesquit acacia (*Acacia constricta*) as the dominant shrub, with shin oak as dominant shrub also and snakeweed as dominant subshrub. Doveweed (*Croton dioicus*) and lanceleaf ratany (*Krameria lanceolata*) are common perennial herbs, and bush muhly is the dominant perennial grass (Schander 1985:40).

Finally, the tobosa flats area comprises the broad flat valley floor of Nash Draw. Tobosa grass (*Hilaria mutica*) is dominant. Other flora are creosote bush, lanceleaf ratany, and Spanish dagger (*Yucca torreyi*) (Schander 1985:40-41).

Additional flora with distributions cross-cutting the above floral associations are desert bluets (*Hedyotis humifusa*), foetid marigold (*Pectis angustifolia*), and bindweed (*Heliotropium convolvulaceum*). Significant introduced species are salt cedar (*Tamarix* sp.) and Russian thistle, or tumbleweed (*Salsola kali*) (U.S. Department of Energy 1980:7-4).

2.5 FAUNA

Vegetation and soil type are the most important determinants in faunal distributions. Mammalian species observed in all habitats of the project area include desert cottontail (*Sylvilagus audubonii*) and black-tailed jackrabbit (*Lepus californicus*). Mule deer (*Odocoileus hemionus*), the most common big game species, occurs in shin oak-mesquite associations. Pronghorn (*Antilocapra americana*) are usually seen on the Divide. Numerous small mammals are often restricted to one or two of the central dune association. Carnivores include swift fox (*Vulpes velox*), gray fox (*Urocyon cinereogenteus*) and coyote (*Canis latrans*). Bats collected include the Brazilian free-tail (*Tadarida brasiliensis*) and the cave myotis (*Myotis velifer*) (U.S. Department of Energy 1980:7-7).

Of the commonly observed reptiles and amphibians, only the side-blotched lizard (*Uta stansburiana*) occurs in all floral associations. The western whiptail lizard (*Cnemidophorus tigris*) and the prairie rattlesnake (*Crotalus viridis*) abound in the creosote bush habitat as well as one or two central dune associations. The yellow mud turtle (*Kinosternon flavescens*) as well as various amphibians are restricted to aquatic habitats such as dirt stock ponds and metal stock tanks (U.S. Department of Energy 1980:7-7).

Bird densities show considerable fluctuation seasonally and annually for mourning doves (*Zenaida macroura*), loggerhead shrikes (*Lanius ludovicianus*) and Cassin's sparrow (*Aimophila cassinii*). Forty of the 122 bird species observed near the WIPP site nest in the area; these include scaled quail (*Callipepla squamata*), ravens (*Corvus corax*), mallards and teals (*Anas* sp.), mockingbird (*Mimus polyglottos*), roadrunner (*Geococcyx californianus*), burrowing owl (*Athaene [Speotyto] cunicularia*), and various broad-winged hawks (*Buteo* and *Parabuteo*) and perhaps marshhawks (*Circus cyaneus*) (U.S. Department of Energy 1980:7-8).

3.0 OVERVIEW AND RESEARCH DESIGN

The purpose of the research design is to provide focus in subsequent data collection phases. The research design consists of four parts. The first part is an overview and critique of the current state of knowledge concerning southeastern New Mexico prehistory and history. The second section details research questions to be addressed. The research questions naturally stem from gaps and weaknesses in the current state of knowledge isolated in the critical review. Questions are summarized in a section entitled Research Design.

3.1 CRITIQUE OF CULTURAL RESOURCE KNOWLEDGE IN SOUTHEASTERN NEW MEXICO

Archaeologists and historians working in southeastern New Mexico have recently profited from the preparation of two major analytical overviews, by Camilli and Allen (1979) and by Stuart and Gauthier (1981), both of which substantially summarize the state of our knowledge of the region roughly prior to 1979.

The current presentation is intended to serve as an adjunct to Camilli and Allen's and Stuart and Gauthier's works. It will present crucial data from areas outside southeastern New Mexico, as well as information on important data recovered since the preparation of the two major overviews.

The goal of the current presentation is to isolate and emphasize those areas of archaeological and historical knowledge of southeastern New Mexico which appear to be most insecurely established and/or most significant for future research and management.

3.1.1 Context and Spatial Limits

Accumulating evidence, in the form of isolated finds, indicates that humans may have regularly traversed the plains in southeastern New Mexico for at least 12,000 years. However, distances from the study area to relatively well-dated archaeological sites which have provided chronological control for local research should be emphasized.

The nearest well-dated PaleoIndian/Early Archaic stratified assemblages lie 200 km to the north-northeast (Blackwater Draw). The nearest well-dated relevant Late Archaic assemblages lie 250 km to the south (Stockton Plateau), 320 km to the northeast (McKenzie Reservoir), 280 km to the north (Santa Rosa Reservoir), and over 200 km to the west (Tularosa, Jornada, and Hueco basins), as do the nearest well-dated Early Formative sites. Ceramic Period sites in southeastern New Mexico are dated primarily on the basis of ceramics from Pecos (370 km north-northwest), from the Chupadera Mesa (290 km northwest), from Lincoln (160 km north-west), from El Paso/Alamogordo (200-270 km west), from the Deming area (290 km west), and from the Casas Grandes area (400 km west-southwest).

Chronological control of data from the Livingston Ridge/Los Medanos typologies, based to date almost entirely on projectile point and ceramic

typologies, has thus impelled the archaeologist to become familiar with the data for all major sites within 200-400 km of the present project location. Put another way, to achieve chronological-typological control for south-eastern New Mexico, the archaeologist must be familiar with the literature for an area of between 120,000 km² 500,000 km² an area roughly as large as the entire state of New Mexico (Figure 3.1).

A critical evaluation of the archaeology of this entire region is clearly not feasible. Consequently, only clearly relevant data will be drawn from geographically distant sources; this review will emphasize what is known about the archaeology and history only of that portion of Lea County lying south of Lovington and that portion of Eddy County lying east of the Pecos River.

These boundaries were chosen to reflect archaeologically significant distributional boundaries. Eddy County west of the Pecos has a distinct archaeological pattern dominated, especially in the Guadalupe Mountains and their foothills, by massive burned rock middens, "ring" middens, rockshelters, and small masonry hunting blinds (Applegarth 1976; Katz and Katz 1979; Mera 1938). Observed frequencies of ceramics and of lithic materials appear to change dramatically as one moves eastward onto the Llano Estacado in the vicinity of Lovington (Leslie 1979).

3.1.2 An Overview Synopsis

3.1.2.1 PaleoIndian Period

Although there can be little doubt that PaleoIndians occupied the study area, little is known locally of these hunters of the terminal Pleistocene, except that their distinctive lanceolate points are reported to have been found by collectors. Hurst (1976:7) cites a personal communication of the presence of points associated with bison and mammoth remains somewhere in the Maroon Cliffs area, and Leslie (1979) reports PaleoIndian usage is "suggested" at some 10% of all sites within the area investigated by the Lea County Archaeological Society.

Just outside the area are four relatively well-reported sites yielding or suggesting PaleoIndian materials: the Milnesand Site (Sellards 1955; Warnica and Williamson 1968), Burnett Cave (Hester 1967; Howard 1935), Hermit's Cave (Ferdon 1946; Haynes 1967, Schultz and Martin 1970), and the Midland site (Wendorf et al. 1955). Of these, Burnett Cave's assemblage (Folsom) is inconsistent with its dating (7432 \pm 300 BP), while Hermit's Cave seems to suggest a pre-Clovis occupation whose character is poorly defined. Both sites may have spurious association with fauna due to mixing (Judge 1973). Milnesand yielded a Bison bone bed with associated tools, including points having affinities with both the Firstview and Agate Basin types (Judge 1973). Both it and the Midland site, the type site for the "unfluted Folsom" or Midland point type, remain insecurely dated. Assemblages from both sites are well described.

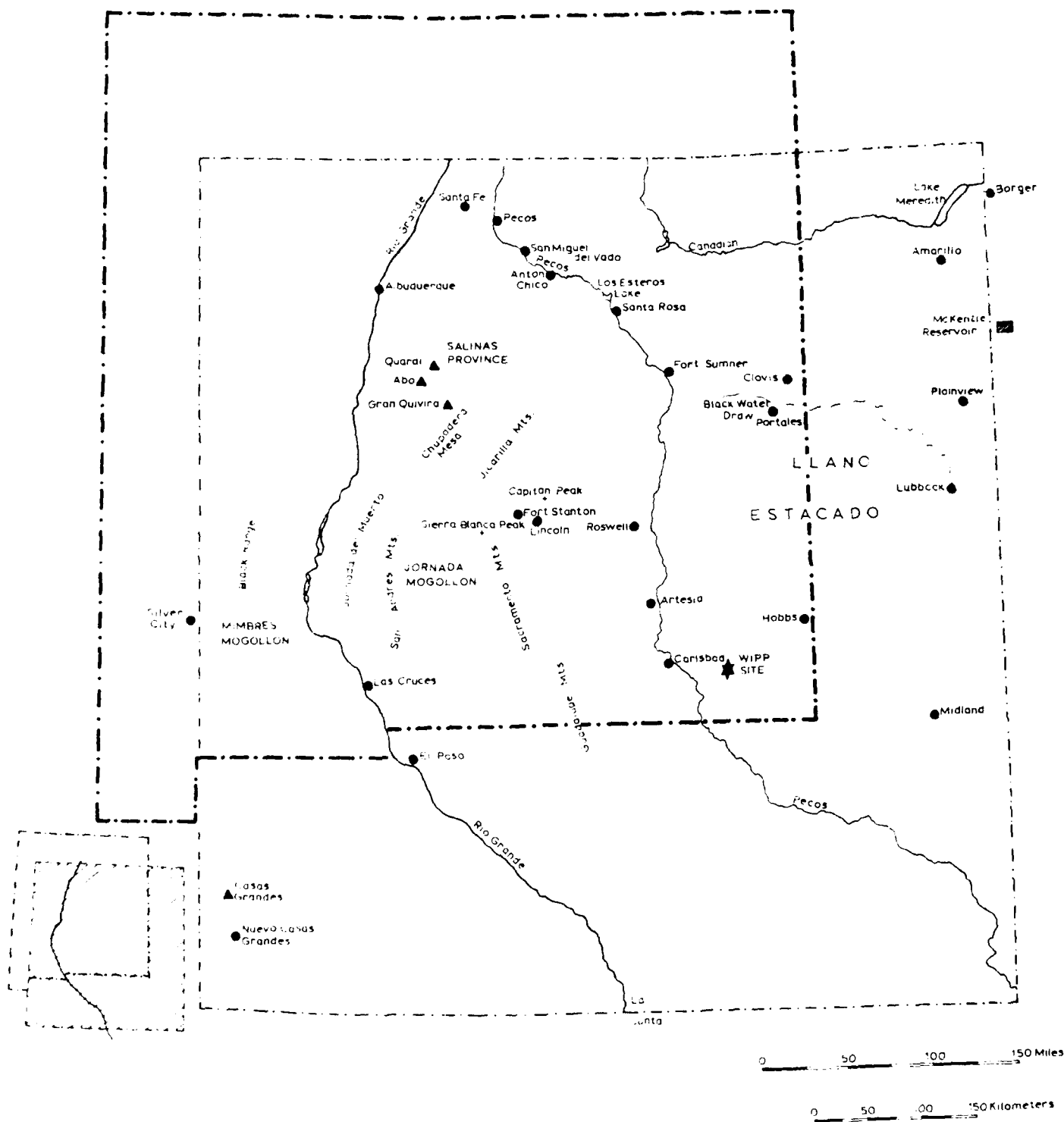


Figure 3.1 New Mexico - Texas - Mexico Regional Map, WIPP Assessment Study, ACOE, 1986.

3.1.2.2 Late PaleoIndian/Earlier Archaic Period

A variety of large lanceolate or lanceolate/stemmed projectile points is reported from collections in the area (Leslie 1978); they seem to be consistent with types commonly regarded in central New Mexico or west Texas as diagnostic of the earlier Archaic. These points are often relatively crude by comparison with the generally excellent Folsom or Cody Complex workmanship. Nevertheless, they are clearly similar to PaleoIndian types both formally and probably functionally. Bertram has seen pieces typologically consistent with the earliest Oshara types, Jay and La Bajada (Irwin-Williams 1973a), in southeastern New Mexico collections, as well as forms classified in the Texas typology as Angostura, Dalton, Kinney, Meserve, Nolan, Pandora, and Pedernales Lanceolate (Suhm and Jelkes 1962). None appear to be known from dated context or from formal excavation within the project area, but an excellent Dalton/Meserve point was collected only a few kilometers to the northwest (Haskell 1977:100-103).

3.1.2.3 Later Archaic Period

An emerging consensus among archaeologists working in the Southwest and southern High Plains views the Archaic projectile point sequence of the region as progressing through time from fundamentally lanceolate large points toward increasingly complex and progressively shorter haft designs, coupled with relatively wide blades. These types describable as broadly side-notched/stemmed/eared (e.g., San Jose, Atrisco) are thought to be generally transitional between lanceolate Early Archaic types and broadly palmate Late Archaic forms, e.g., En Medio, Basketmaker, Carlsbad, Marshall, Marcos, Williams, Ellis (Bertram 1985; Irwin-Williams 1973a; Johnson 1967; Shelley, personal communication 1985). Milling implements become a regular part of assemblages for the first time in the Late Archaic (Landis 1985), as do drills and burned rock middens.

3.1.2.4 Archaic/Early Ceramic Period

In most areas adjacent to southeastern New Mexico, the end of the Archaic is defined by the appearance of ceramics, evidence of sedentism and of more than casual horticulture, and by the relatively rapid replacement of atlatl/dart/large palmate point technology by bows, arrows, and similar but much smaller palmate or triangular arrow points. These shifts seem to have occurred concurrently across the Colorado Plateau (Anyon 1985; Cordell 1979; Stuart and Gauthier 1981), eastern Colorado (Eighmy 1984), northeastern New Mexico, and west Texas (Hughes and Willey 1978). Chronological markers outside southeastern New Mexico for this period include not only arrow points, e.g., Scallorn, Alba, Bonham, Deadman's and perhaps Keota types, but also ceramics, e.g. Lino Gray, Alma Plain, Woodland Cordmarked, and Los Pinos Brown, and evidence of surface lodges or pithouses. Many reliable absolute dates place this transition generally in the first few centuries A.D.

In southeastern New Mexico, the same transition is generally considered to date toward the end of the first millennium A.D. and, moreover, to have occurred only incompletely (Jelinek 1966; Mobley 1978; Speth and Parry 1984; Stuart and Gauthier 1981). It would not be entirely inaccurate to summarize

the generally held view of the southeastern New Mexico Early Ceramic Period as a period of transition between the Archaic and the Middle Ceramic lasting only a few decades.

3.1.2.5 Middle Ceramic and Protohistoric Periods

By the early years of the second millenium A.D., the residents of southeastern New Mexico were clearly either part of or interacting with Puebloan (Jornada Mogollon) groups. Side-notched arrow points and rare structures characterize assemblages, as does pottery copied from or carried from south central and central New Mexico. Horticulture is evidenced rarely (Ayre 1936; Jelinek 1960, 1967; Jennings 1940), yet tool kits largely indistinguishable from Late Archaic kits co-occur with pottery traded or carried from as far away as the Casas Grandes and Pecos areas. Late in the prehistoric sequence, tools and ceramics thought to be diagnostic of Plains adaptations appear (Collins 1966, 1968, 1971; Leslie 1979; Lintz 1984), and traded Puebloan ceramics become relatively scarce. There is reason to suspect continuity between these assemblages and those thought to pertain to protohistoric and early historical groups (Hughes and Willey 1978; Johnson et al. 1977; Leslie 1979; Levine and Winter 1987, Speth and Parry 1984), including perhaps the Pecos Valley Jumano and Plains Apache.

3.1.2.6 Historical Period

The protohistoric period persisted in southern New Mexico longer than it did elsewhere in most of the western United States. The first recorded Spanish entry into the area was in the early decades of the sixteenth century. However, no actual Spanish settlement occurred in the study area in the 1600s or 1700s. The study area was economically most important as a portion of an expansive trade network which was operated first by Pueblos and Apaches and later by the Spaniards, who expanded the network to Chihuahua along the Camino Real.

The Spaniards were forced from the New Mexico province by the Pueblo Revolt in 1680. They returned in the early 1690s to find the beginnings of a stronger Comanche presence. The Spaniards eventually allied with the Comanches to contain the Lipan Apaches. This alliance lasted only so long as the Lipanes were a threat, and the Comanches essentially controlled the southern Plains from 1750 to 1776. In 1786, a peace accord was reached between the Spaniards and the Comanches. Spanish influence over the region allowed buffalo hunters (ciboleros) and traders (Comancheros) to operate with a degree of protection from the Comanches.

Mexico became an independent republic in 1821 and the study area fell within the state of Chihuahua. Mexico exercised control for little more than 20 years before Anglo-American settlers from Texas and other border states began moving into eastern New Mexico in the 1940s. Irrigation farming was attempted in some areas, but the paucity of water in the study area made it unattractive for farming.

Cattle ranching was initiated in the region following the Civil War. The open grazing land made the area ideal for the raising of cattle that were

driven to rail terminals in the north. Texan John Chisum became the "Cattle King" of the region in 1868, and his influence dominated political and economic life in the region. Drought and declining market prices signalled the beginning of the end of open range livestock raising in the western United States in the 1880s.

Irrigation agriculture again became important in the 1890s, following the demise of open range ranching. C.B. Eddy became the region's leading entrepreneur around that time, and Eddy County is named for him. Several irrigation projects insured a sustainable agricultural economic base. A railroad was constructed to the area in the 1890s and southeastern New Mexico became a full participant in the mainstream of social and economic life in the western United States.

The study area, like most of the western United States, began to be an important mineral development region in the early twentieth century. Today potash mining and oil and natural gas exploration probably exceed agriculture as the primary economic support of the area. During World War II military operations became an important factor. They remain so today. Important historical events in the vicinity are summarized in Chapter 8, Table 8.1.

3.1.3 Historical Bases for Prehistoric Chronology

Although the first systematic overview of southeastern New Mexico was attempted by Mera (1938), it was not until Corley's (1965) work that a chronology was advanced for the region. Corley's sequence was explicitly patterned after that proposed by Lehmer (1948) for the Mogollon of the Jornada del Muerto; Corley's dates were based on formal similarities or identities between ceramic types collected by the Lea County Archaeological Society and types dated by Lehmer and others for Puebloan regions to the north and west. Soon thereafter, Jelinek (1960, 1966, 1967) advanced a chronology for the Pecos Valley between Roswell and Santa Rosa; simultaneously other workers (Broilo 1971; Ellis and Hammack 1968; Kelley 1966; Marshall 1973a; Wiseman et al. 1971) were beginning to advance chronologies for Mogollon occupations of the south central New Mexico highlands (Table 3.1). Most of these chronologies were tied to and largely dated from the Lehmer chronology for the Jornada proper which, in turn, was based on the western Mogollon chronology (Haury 1936) until after the Mesilla phase, when the Mimbres and Jornada Mogollon sequences diverged. The Sierra Blanca sequence (Kelley 1966) is related more closely to the Anasazi Pecos classification than to the western Mogollon system.

It is not altogether clear why Lehmer chose to date Jornada Brown pottery as appearing as late as circa A.D. 900; it is quite clear that all the derivative southeastern New Mexico chronologies date Jornada Brown, the first ceramic type in the area, as appearing later than A.D. 900 primarily because Lehmer did so. The exception is Jelinek (1966, 1967), whose Early 18-Mile phase is dated to pre-A.D. 900 on the basis of plain grayware, which presumably was not thought to be of Mogollon origin. Today, in spite of drastic, substantiated revisions to the Lehmer chronology (Anyon 1985; Anyon et al. 1981; Whalen 1978, 1980, 1981; O'Laughlin 1980; Hard 1983; Marshall 1973a), serious doubts expressed by Wiseman (1984) and Warren in Hughes and

Table 3.1 Jernada Moqillon Sequences, WIPP Assessment Study, ACOF 1986

| | Central Corridor | Eastern Corridor |
|---------|--|--|
| AD 1000 | (offered) Black and White 1983, Lehman 1949, Lekson 1974) | Hector 1974, (offered) Allen 1976) |
| | | PUEBLO I-A |
| | | QUECHO |
| AD 1000 | LATE EL PASO (LATE PUEBLO) Late El Paso Polychrome, Gila and Santo polychromes | El Paso Polychrome, Three Rivers Line, Gila (el Paso), Lincoln Glaze A Red and Yellow Lincoln B/R, Santa Indented, Chupadero B/W |
| | | TRANSITIONAL |
| | | Glaze A Red and Yellow, Santa Fe Polychromes, Lincoln B/W, Three Rivers R/T, Playa Red, Cerro Corral El Paso Poly., Northern Area Brown, Northern Area Coralline |
| | EARLY EL PASO (EARLY PUEBLO) Early El Paso Poly., Mimbres B/W, Chupadero B/W, White Mt. redwares | MALJAMAR |
| AD 1000 | DONA ANA (TRANSITIONAL, PUEBLO) Early El Paso Poly., Jornada Brownware, Mimbres B/W, Chu- paderno B/W, White Mt. redwares | El Paso Brown, El Paso Polychrome, Mimbres B/w, Chupadero B/W, Three Rivers B/W, B/W, Santa Fe Line, Chupadero B/W, Jornada Brown, Jornada Red/Brown, Santa Fe Red/Brown, Middle River Niaga- ceous Brown and Red/Brown, McKenzie Brown and Red/Brown, Northern Area Brown and Red/Brown and Santa Fe Central Area Brown, Southern Area brown |
| | LATE PUEBLO I (QUECHO) Jornada and Late El Paso brownwares, Bolafago B/W | QUECHO |
| AD 1000 | | Northern Area Brown and Red/Brown, Central Area brown and Red/Brown, El Paso Brown, Jornada Brown, Southern Area Brown, Mimbres B/W, Lincoln Red/Brown, Three Rivers Red/Brown Cotton Boldline, Chupadero B/W, Santa Fe Brown and Red/Brown, Middle River Micaceous Brown and Red/Brown |
| AD 1000 | | HUECO |
| AD 1000 | | Plain Brownwares |
| AD 1000 | EARLY PUEBLO I Early El Paso Brownware Santa Fe Brownware | |
| AD 1000 | | |
| AD 1000 | | |

Willey (1978), and the recovery of well-dated Jornada Plainware from much earlier contexts located far beyond the study area in the Texas Panhandle (Willey and Hughes 1978), the Lehmer/Corley/Leslie/Jelinek Jornada Extension chronology continues in use, essentially unchanged and unrevised, by almost all academic, avocational, and management archaeologists in southeast New Mexico.

An equally unfortunate but persistent practice in southeastern New Mexico archaeology is the continuing use of the dates suggested by Suhm and Jelks (1962) for Texas projectile points - dates largely repeated by the standard Oklahoma point chronology of Bell (1958, 1960) and Perino (1968). These indispensable works contain date ranges drawn from early studies, mostly in east, south, and central Texas. The dates given were frankly acknowledged by the authors to be informed guesses, based largely on excavated or collected assemblages which we now know to have been seriously mixed.

Archaeologists in southeastern New Mexico are not unaware of the shortcomings of the Jornada Extension ceramic and Texas projectile chronologies. Rather, these systems continue in use simply for lack of modern, authoritative replacements or revisions, the need for which is universally acknowledged.

3.1.4 Paleoclimate and Culture

The evident chronological problems of southeastern New Mexico archaeology have had important impacts on methodological, theoretical, and lifeway reconstruction studies both within and outside of the study region. These impacts are most significant in four problem areas:

- . the dynamics of culture change,
- . the dynamics of inter-regional interaction,
- . the relation of subsistence to technology, and
- . the relation of subsistence to resource character and availability.

Paleoclimatic reconstructions, centrally important in many approaches to archaeological understanding, have been carried out for a number of localities in southeastern New Mexico. These are well summarized by Camilli and Allen (1979). They include studies from fossil woodrat middens (Riskind and Van Devender 1979; Van Devender and Spalding 1979; Van Devender and Wiseman 1977; Van Devender et al. 1978; Wells 1976, 1978) pollen studies (Bryant 1969, 1977; Freeman 1972; Hafsten 1961; Martin 1963, 1967; Oldfield and Shoenwetter 1975), faunal studies (Applegarth 1975; Jelinek 1966, 1967; Mobley 1978; Speth and Parry 1980, 1984; Nials et al. 1977) and geological studies (Chugg et al. 1971; Irwin-Williams and Haynes 1970; Nials 1980). These studies will provide an invaluable baseline for the evaluation of cultural phenomena in the region, if a reliable cultural chronology can be developed.

Major arguments for the climatic and environmental explanation of cultural change in southeastern New Mexico have been advanced. These include Jelinek's (1967) model of shifting subsistence and settlement in response to changing rainfall and Bison availability. Similar arguments are advanced by Speth and Parry (1984), as well as by Camilli and Allen's (1979:73, 101, 124)

suggested correlation of climatic change with the Archaic-Ceramic transition. "The end of [the Whitewater] drought [at 1200 B.P.] corresponds to the passing of an Archaic adaptation in the study area and with the beginnings of a sedentary lifestyle" (Camilli and Allen 1979:73).

The problem of chronology has led to the development of important methodological and theoretical arguments dealing with the presence of a "tardy" or "persistent" Archaic in southeastern New Mexico, the most influential of which is that of Mobley (1978), who views the ceramic period Pecos Valley occupations as representing fundamentally mobile Archaic hunter-gatherers engaged in trade for ceramics and agricultural products. Both Camilli and Allen (1979) and Stuart and Gauthier (1981) expend considerable effort discussing the adequacy of Mobley's models and methods; neither seriously questions his chronological underpinnings. Yet if the southeastern New Mexican Archaic is shown to be neither "persistent" nor "tardy," the debate is rendered academic.

Interregional interaction is clearly an important factor in southeast New Mexico cultural development. In preceramic times, the highly mobile adaptations generally modeled for PaleoIndian and Archaic peoples would have ensured a substantial regular flux of people through the area. The total identity of most southeastern New Mexico ceramic types with materials from the Jornada del Muerto and points farther south, west, and north compel us to model ceramic period occupants of the area as either congeners of the Jornada Mogollon, or perhaps as the Jornada Mogollon themselves engaging in long distance periodic or seasonal forays. Certainly the very early Jornada Brown/Alma Plain pottery recovered in Deadman's Shelter Level D and dating to the second century A.D. (Willey and Hughes 1978) indicates long range movement by Plains or Puebloan groups occurring very early in the Early Mesilla phase. Hughes's (Hughes and Willey 1978) report of the widespread distribution of the Palo Duro aspect (i.e., Deadman's Shelter) occupations south of the Canadian River along the eastern margin of the Llano Estacado strongly implies that Jornada Mogollon people or their trading partners were capable of routine long distance trade and travel. If this model is correct, then an accurate elucidation of the archaeology of southeastern New Mexico can be seen to have clear and immediate importance for our understanding of cultural dynamics in the Jornada "heartland" and, by extension, all of southern and central New Mexico and west Texas.

3.1.5 Deposition and Soil Dynamics

Our ability to recover and evaluate data from southeastern New Mexico archaeological sites is dependent not only on our capacity to date sites, but also on the degree to which assemblage elements from a given site can be shown to be contemporary. There is good reason to believe that the great majority of assemblages recovered to date in and near the study area are palimpsests; many "assemblages" seem to represent mechanical, deflationary, and aeolian mixtures spanning thousands of years (see especially the depositional disturbance analyses in Speth and Parry [1984] and in Landis [1985]). Soils in the region are dominated (Nials 1980:17-22) by aeolian reworkings of local alluvium; stable pedogenic development seems to have occurred only a few times: in the Terminal Pleistocene, in the Middle Archaic period, and during

the Middle Ceramic period. Except for archaeological materials included in these horizons or contained within features, there may be little justification for the usual assumption that stratigraphic or spatial propinquity of artifacts implies contemporaneity of deposition. Rather, most assemblages have probably experienced multiple deflations and heavy mixing.

Lord (1985:55) reports his belief that cultural materials within dune sands remain essentially within depositional context, although both he and Nielson (1977:18) confirm that visible materials tend dominantly to occur on reddish sandy clay loam, possibly Terminal Pleistocene in age, at the bottom of deep blowouts.

3.1.6 Absolute Chronology in Southeastern New Mexico

Reliable chronological benchmarks for southeastern New Mexico, as for all of the high plains of New Mexico (Bertram 1985) are rare. Intelligent interpretation of the few absolute dates available requires extensive evaluation of unevenly reported excavational techniques, inadequately documented depositional contexts, widely varying descriptive criteria, poor illustrations, and varying understanding on the part of other researchers of the rapidly changing standards of modern radiocarbon interpretation. Nevertheless, good chronometric data are to be had from within the Pecos Basin/Southern High Plains region, thanks largely to the efforts and high standards of some researchers, especially Levine and Mobley (1976; Mobley 1978), Hughes and Willey (1978), and Speth and Parry (1978, 1980, 1984). A significant addition from sites in the present study area was provided by Lord (Lord and Reynolds 1985).

Good radiocarbon dating in southeastern New Mexico requires not only careful collection and meticulous chemical and radiometric analysis, but also consideration of the biochemistry of the carbon source (Downton 1975; Eickmeier 1978; Syvertsen et al. 1976; Shelley, personal communication 1985), judicious calibration (Stuiver 1982; Klein et al. 1982), and careful analytical evaluation of the reliability of the association between the dated carbon and other artifacts. The failure of some past studies to segregate datable plant remains from plants with markedly different uptake rates for the different carbon isotopes has resulted in C-14 dates which can be centuries in error.

Excavated rockshelters just north of Santa Rosa, New Mexico (Levine and Mobley 1976; Mobley 1978), have produced a series of apparently uncorrected dates ranging across the Late Archaic and Ceramic periods. Bertram (Levine and Winter 1987) has extensively reinterpreted these dates and their significance; a summary of conclusions reached in Bertram's re-evaluations is presented here.

1. Only dart points predate A.D. 60 ± 44 .
2. Corner-notched dart points are gradually replaced by corner-notched arrow points, perhaps beginning around A.D. 400.

3. Side-notched arrowpoints replace corner-notched arrow points some time around A.D. 1000.
4. Brownware ceramics appear at least by A.D. 1000 and probably much earlier.

Speth and Parry (1978, 1980, 1984; Speth 1983) have reported on important assemblages from the Roswell area, drawn from habitats comparable to the Livingston Ridge/Los Medanos study area. Their high standards of reporting permit the derivation of several chronometric reference points, not all of which (Levine and Winter 1987) agree with their interpretations.

1. Large and small dart points may substantially predate A.D. 885 ± 55 .
2. Side-notched arrow points (Washitah variant) probably date at least as early as A.D. 1200, continuing into historic times.
3. Triple-notched arrowpoints (Harrell variant) may date no earlier than A.D. 1450.
4. Basal-notched arrow points (Garza variant) may date only as early as the late 15th or 16th centuries.

All dates are apparently C3/C4(C13)-corrected; multiple calibrations were considered by Speth and Parry (1984).

Deadman's Shelter (Willey and Hughes 1978), a site on the eastern Llano Estacado margin near Tulia, Texas, has provided a data base that is much more chronologically definite than those from the previously described sites. Two cultural levels bounded above and below by relatively sterile deposits yielded rather similar assemblages. The upper level (Stratum B) was radiocarbon dated to A.D. 465 ± 70 and A.D. 710 ± 65 (apparently uncorrected). Both it and the earlier stratum D yielded corner-notched Scallorn and Deadman's (Alba-like) arrow points and Jornada/Alma brownware almost exclusively. The lower level (Stratum D) yielded the same arrow point types, together with a variety of stemmed and corner-notched dart points. Stratum D was dated at A.D. 210 ± 40 and A.D. 150 ± 60 ; it also yielded Jornada/Alma brownware. Other tools recovered include manos, metates, drills, and scrapers very similar to those from New Mexico. No recognizably typical side-notched points were recovered from Strata B or D. Warren (personal communication cited in Hughes and Willey 1978:189) identified the temper and manufacture of the brownware vessels as being consistent with materials from the Sierra Blanca region of New Mexico, some 130 km west of the Pecos.

One piece of obsidian was reported from Level D, the lower level of Deadman's Shelter. Obsidian in southern Plains sites is generally thought to be from the Rio Grande Valley area of New Mexico. Both the obsidian and the ceramics argue for very long range contacts, on the order of 400 km (ca. 250 mi). It seems implausible that pottery should reach the eastern boundary of the Llano Estacado in trade but that the implied access to the same items in intermediate areas should have had no important effect on the technologies of those areas. Moreover, Deadman's Shelter does not appear to be a fluke. So

many similar assemblages have been recognized in surface collected sites in west Texas that a generally agreed upon cultural complex, Palo Duro, has been named (Hughes and Willey 1978). Palo Duro occupations span the early ceramic (A.D. 0-900) period. They are characterized by small corner-notched points of the generalized Alba/Bonham/Deadman's/Scallorn pattern, associated not uncommonly with plain brownware pottery that is quite distinct from the Woodland types found farther north (Couzzourt 1982; Hughes and Willey 1978:190). It is hard to imagine an assemblage that would better inform us on the chronology and character of the Pecos and Southern Plains Archaic/Ceramic transition than that of Level D in Deadman's Shelter.

The Sand Pit site (Hughes and Willey 1978), while not well dated by radiocarbon, seems to present a mostly late prehistoric and early historical Amerindian assemblage that included gunflints, crude metal tools, trade beads, and possible whetstones, as well as other groundstone tools and numerous scrapers. There appears to be little doubt about the identity of the European gunflints, and bifaces made from local materials may also be gunflints. Also present was an array of stone scrapers and two sidenotched points, one of which, if accurately associated, would suggest that the Keota (convex-based side-notched) point type persisted from the early ceramic until the historical period. Remarkably, no other assemblage examined in this review exhibited such a numerical preponderance of various scrapers over bifaces. Perhaps the main occupation of the Sand Pit site was sufficiently recent that metal points and knives had largely replaced bifaces, but traditional stone scrapers were still being used in great numbers for unknown but obviously significant and varied tasks.

Also noteworthy at the Sand Pit site is the preponderance of Alibates material. None of the other Tule Canyon sites with sizeable lithic samples exhibited a preponderance of exotic lithic material, and most sites had only a small percentage of Alibates (Hughes and Willey 1978). Perhaps horse or dog nomadism of a high order is to be suggested for the Sand Pit site; a view not inconsistent with the early historical Comanche identity assigned by the excavators to its more recent elements. It would follow that the dominance of exotics in the overall assemblage may also be taken as fair evidence that the bulk of the assemblage is indeed contemporaneous with the few historical Plains artifacts recovered.

Recent work on the WIPP site (Lord and Reynolds 1985) has produced a corpus of radiocarbon dates which seem to support chronological assertions made earlier in this presentation. *Atriplex* spp, a plant with a high C-14/C-12 fixation ratio, may have contributed significantly to the charcoal dated by Lord and Reynolds (1985); if so, the dates they advance could be several centuries too young (Shelley, 1985 personal communication). These dates, drawn from excavations at ENM 10230 and ENM 10418, indicate that:

1. Jornada Plain Brownware is present in the study area at least as early as A.D. 600.
2. Deadman's and Scallorn corner-notched arrowpoints are in use perhaps by A.D. 520 ± 80 and incontrovertibly (point in hearth feature 31, site ENM 10418) by A.D. 660 ± 70 .

3. Those dart points occurring after roughly A.D. 500 are small, and may actually be large arrow points.
4. Large dart points of the Ellis/Leslie 8 D and similar types date as early as 880 B.C. \pm 14.

Other published but uncorrected dates from the area may be less reliable, but seem to establish a shallow pithouse occupation, a few km northeast of Los Medanos at Laguna Plata, as early as A.D. 760 \pm 95 (Haskell 1977). A Jornada Brown assemblage may have been reliably dated in the study area at ENM 10233 (Schermer 1983) as early as A.D. 420 \pm 160. Landis (personal communication, 1985), also has acquired an unpublished and problematically early date (near A.D. 300!) for a Washitah arrow point in a hearth near the study area. This last date may be too early due to the burning of old wood.

Of the dates just summarized, not one is drawn from an indisputable association of a C-3/C-4-corrected and properly calibrated date with a diagnostic artifact. All things considered, the best dates presented are probably those based on work at Deadman's Shelter, on the point found in Feature 31 at ENM 10418, and on the "Garza hearth" isolated assemblage reported by Speth and Parry (1984).

It is worthwhile to consider explicitly some fundamental points of chronometry. Earlier materials commonly and undetectably are "intrusive" in later assemblages - even prehistoric New Mexicans seem to have been avid arrowhead hunters - but the possibility of intrusion of later materials into earlier assemblages can be ruled out, in some cases, by careful selection and excavation of loci. Small, isolated assemblages are far less likely to be mixed than are large, extensive scatters, especially in special use areas which experienced essentially redundant exploitation for millennia (e.g., the WIPP site area). We still lack much necessary radiometric data (e.g., the mean radiocarbon age at death and the biochemical isotope-fractionation properties of mesquite, shin oak, and other local fuel sources).

3.1.7 Summary

Reliable chronological control of archaeological data in southeastern New Mexico is largely lacking. Surficial, deflated, or mixed multiple occupations in dunal deposits are characteristic of most sites within the region. Uncritical application of poorly substantiated and obsolete chronologies continues, based mainly on associational inferences which are often drawn from surficial assemblages lying hundreds of kilometers to the east or west of the study area. Effective evaluations of the existence or significance of correlations between environment and culture or in culture change between regions are not yet possible. Nonetheless, premature attempts have produced influential but dubious theoretical constructs based on a possibly nonexistent "persistent" Archaic. Further attempts have been made to correlate possibly misdated major events in southeastern New Mexico prehistory with climatic or environmental changes.

3.2 RESEARCH PROBLEMS

3.2.1 The Prehistoric Period

This document has advanced a perspective on southeastern New Mexican archaeology which suggests that primary research needs of the area extend across the breadth of middle range and operational theoretical concerns; equally important are serious lacunae in basic factual and chronometric knowledge. It is the opinion of the authors that study of macrotheoretical problems such as the explanation of adaptations and their spatiotemporal dynamics will remain premature in southeastern New Mexico until these lower-level methodological and factual problems can be resolved. Similarly, regional models of subsistence are premature without the appropriate chronological framework. Preliminary chronological patterns were presented above in the discussion of the Santa Rosa and Roswell areas. In this sense, southeastern New Mexico is genuinely backward; many macrotheoretical problems approachable in well studied areas of western New Mexico, for example, are inaccessible in the Pecos Valley for want of those basic data taken for granted by San Juan Basin or southwestern New Mexico researchers.

While this study cannot present alternative models to those discussed above, it does suggest fruitful avenues of research to address these data and interpretive gaps. At our present stage of knowledge, the most badly needed data in southeastern New Mexico are chronometric. Virtually no chronological control exists for the Early and Middle Archaic periods. The dates generally assumed for the Archaic/Ceramic transition are patently wrong and perhaps 700 years too late. We cannot as yet evaluate the synchronicity of post-Maljamar/pre-Ochoa, Ochoa and post-Ochoa adaptations with well documented parallel adaptations in the Canark area to the north, nor can we even guess at the architectural parallels or lack of parallels between the Jornada Mogollon and the local Jornada Eastern Extension. We know nothing of the material culture of the protohistoric Pecos Jumano.

For the foreseeable future, adequate chronological control can be obtained, especially for survey and reconnaissance, only through the development of locally based typological dating of lithic and ceramic artifacts. Existing systems of typological dating have an inadequate or absent factual basis: all are drawn mostly from seriation studies of surface assemblages far to the east or west of the study area.

Chronometric benchmarks can be obtained in the area through thermoluminescence analysis, C-14 dating, obsidian hydration analysis, and archaeomagnetic dating, coupled with careful evaluation of depositional integrity, plant taxonomic sources of dated carbon, possibility of natural refiring of clays in pottery or soil features, and obsidian sourcing.

It is obvious that not only stylistically or technologically diagnostic items require chronometric and depositional evaluation and control. Wherever deposit synchronicity control can be reliably established (e.g., small assemblages isolated in space or within an intact feature), whole assemblages must be evaluated to determine if assemblage variation can be ascribed to chronological differences, situational variation, strategic variation, or some

combination of these. To this end both chronological and subsistence data should be aggressively sought in such assemblages. Before assemblage data can be meaningfully evaluated, brushfires, mixing, redeposition, deflation and other disturbances should be ruled out as far as possible.

Appropriate testing strategies should include geomorphological evaluation of the integrity of possible relict paleosols, as well as recording during excavation of flake orientation and cross bedding, material concentrations indicative of past deflation episodes, evidence of sheetburning, and any other data capable of informing us of the degree of integrity of a cultural deposit or of the likelihood of past thermal, mechanical or biological disturbance. Valuable supporting evidence for local chronometric determinations is obviously implied in the presence of exotic materials or styles in local sites. These items provide a presently unassessed but clearly valuable cross-check for locally based chronological and adaptational evaluations in that they in some way reflect interactional ranges and broad spatial placement of assemblages. Inferences about the chronological import of local styles or techniques can only be strengthened by exotic evidence for interaction with areas where stylistic and technological chronology are better understood.

Techniques for site recognition and the evaluation of potential in undeflated (and hence surficially invisible) loci must be developed. The special value for research implied by small assemblages or surficially undetectable structures and features demands that systematic subsurface probing, augering, and test excavations should be an important research emphasis. The diminished value of palimpsest assemblages apparently characteristic of most large sites in the area requires that rapid in-field evaluation techniques, such as material homogeneity assessment, be employed before research effort is invested in these presently uninterpretable resources.

3.2.2 The Historical Period

As the area was the province of native inhabitants throughout the historical period between 1530 and 1860, a great deal of research will focus on correlating ethnographic accounts with material remains. It may be possible to model subsistence and social interaction in the protohistoric and historical period. As an example, research should focus on Spanish records of Humano Pueblos (especially Gran Quivira) and the Jumano trade between 1630 and 1680. This is of primary importance since the project area was used by the Pueblos as a hunting site. This situation might prove to be an interesting corollary between the Mogollon and its eastern extension.

The Comanches became the major population present in the study area following abandonment of those portions of the southern Plains used by the Jumanos under Juan Sabeata. The Comanches maintained a complex array of relations, ranging from symbiotic trade to open warfare with their neighbors, including the Lipan, or Southern Plains Apache, several Puebloan groups and the Spaniards, as well as the relatively sedentary Mescalero Apaches. The complexities of these interactions have not been fully documented and a combination of archival and archaeological evidence from the study area may help shed more light on this problem.

The Mescalero Apaches, who lived west of the Pecos, are an especially important group since theirs is the best documented indigenous culture in the region. Social organization, settlement, subsistence, and trade relations are among the issues that are of concern relative to the Mescalero. Furthermore, since they seem to represent a compromise adaptive strategy between full sedentism (along the lines of the Pueblos), herding, and nomadic hunting and gathering, similar to what the Jumanos and Sumas may have practiced, the Mescaleros offer a unique opportunity to analyze the flexibility implicit in the transition from one lifeway to another.

The San Saba expedition also merits further study because the expedition members camped with a group of Mescaleros in Los Medanos in 1763. The present day Los Medanos sand dunes are located on the James ranch in the project area. From the expedition account, it seems clear that both Lipan and Mescalero Apaches were in the region. The Comanche and Spanish attacks on the Apaches indicate that the former were also present. Los Medanos appears to have been a well known and frequently utilized area. The accounts mention that to obtain water in the sand dunes the Indians merely scooped a hole in the sand and waited for it to fill. Unfortunately, Spanish use of the area, documented archivally, is not well reflected in the archaeological record.

A peace accord reached between the Comanches and the Spaniards in 1786 opened the region to two historically important economic developments, organized buffalo hunting by Hispanic and Puebloan "ciboleros" and a renewal and expansion of the earlier extensive trade networks by Comancheros. Both of these events placed eastern New Mexico in a position to receive a wide array of both physical and ideological input from the Plains culture area to the east and north and from Spanish-dominated regions to the west and south. The combination of these two practices (buffalo hunting and trade) adds a new dimension to the already prolific cultural diversity of the area. The full impact of the ciboleros and Comancheros on the cultural make up of groups in the study area has not been evaluated. Much of the information needed to document this situation is available in Chapter 8; material cultural items particular to this era were not identified during the study.

Early in the nineteenth century, Comanchero trade began to mesh with an increasing American trade influence in the Southwest. American trade to the north of Santa Fe is fairly extensively documented, but the influence of this activity in southern New Mexico is much less well understood. Documentary and material culture evidence may add to our understanding of the earliest American presence in the area.

The importance of Comanchero trade was cut short by the late 1860s when Texan influence in the area grew stronger. Friction soon developed between Texans moving in from the east and the extant "Hispanic" population. As cattle grazing became the predominant economic activity in the region, Texan influence continued to increase and eventually the Lincoln County War erupted. Texan domination of the region followed that armed conflict.

The consequent overshadowing of the Mexican presence in the area has resulted in a serious gap in the historical record. Documentary evidence is

augmented in this report by oral histories, and archival records from nongovernmental sources, especially church records. Permanent Mexican villages are documented wherever possible in Chapter 8.

Development of the cattle industry was a natural outgrowth of the need for beef at U.S. military posts established to control Navajo, Kiowa, Comanche, and Apache raiders in the area. The first cattle trail in the area was established along the Pecos river in 1866 by Charles Goodnight and Oliver Loving, and by 1868 Texan John Chisum dominated much of the area by controlling key springs along the river. A combination of overgrazing, drought and dropping prices for beef caused the demise of open range cattle ranching by the late 1880s. Ranching in the area did continue, but as elsewhere in the west, fencing, grazing rights and water rights became critical issues.

The transition from open range livestock production to ranching involving fenced grazing areas and production of hay crops for winter use and is an important historical issue in the arid west. Fencing became a common practice as a response to the need to control the numbers of animals relative to available grazing and water supplies. Herd grazing patterns were also controlled by the availability of water which could be artificially manipulated by drilling wells and constructing water storage facilities. The carrying capacity of the land was similarly augmented by storage of summer grasses as hay for winter use. The adaptive strategies of the livestock industry are certainly as tied to the natural environment as those of prehistoric hunter-gatherers and bison hunters.

Ranching remains an important economic activity in the study area. Although technological changes have altered some aspects of ranching operations, such as the labor force required for various tasks, the relationship between people and the land is still an important issue in all of the western United States. New demands are increasingly being placed on the western states in the areas of energy and mineral production, placement of national defense bases and other facilities vital to national interests. These issues are not really new at all but simply reflect the latest overlay of human adaptive strategy in this environment.

3.3 THE RESEARCH DESIGN

Many avenues of research have been suggested in the body of this document. In this section, those suggestions will be clearly defined. It should be emphasized that the solution of all of these problems will not occur in a Class II survey. Solutions will be attempted but the purpose of the research design is to provide focus for subsequent research.

Prehistoric research questions are summarized in Table 3.2. The problems isolated are quite simple and interrelated. The basic problem is to establish an accurate chronology based on an accurate typology, which in turn is based upon absolute dates. The suggested approach and focus of this research design is to isolate single component sites and to date them. Only when this is accomplished can we adequately assess changes in settlement, subsistence, and social interaction through time.

Table 3.2 Summary of Prehistoric Research Problems, WIPP Assessment Study, ACOE, 1986.

| Problem | Suggested Approach | Method |
|----------------|--|---|
| Chronometric | Sample isolated single component sites | Archaeomagnetic, obsidian hydration, thermoluminescence, corrected radio-carbon dates |
| Local typology | Sample isolated single component sites | Correlate absolute dates with diagnostics |
| Subsistence | Sample isolated single component sites | Pollen, flotation, and faunal analysis |

Historical research problems are far more specific than are the prehistoric problems. Key questions hinge upon an ability to model protohistoric adaptations using archival records. If such models can be developed, they can be compared to archaeological data. Other historical research questions are purely exploratory. For example, is it possible to determine whether or not early Spanish, Mexican and American populations used the study area, and if so, is that use reflected archaeologically? Is it possible to ascertain what the effect of ciboleros and Comancheros was on the indigenous population? Methods used to collect relevant data are specifically addressed in the following section.

3.4 OPERATIONALIZING THE RESEARCH DESIGN

3.4.1 Survey Sampling Methodology

As suggested in BLM Manual S111, the purpose of a Class II survey is to obtain a representative sample of the density and variety of archaeological resources in a given area. Results are designed to produce management data useful in developing projections concerning the character of the population of resources in a given area along a number of different parameters. To this end, a biased stratified sample is dictated; it is suggested that the stratification should not be exceedingly complex.

3.4.1.1 Sampling Methodology-Zones III and IV

Sampling for the survey of WIPP Zones III and IV was carried out by dividing all sections lying completely or partially within Zones III and IV into quarter-section units. These were classified as Ridge or Knoll (R), South Slope (S), Basin or Flats (B), and North Slope (N), according to the representation of various landforms within each unit. Landforms were defined by the following procedure using data drawn from the Nash Draw USGS 15'

topographic map and from the Divide and Bootleg Ridge USGS 7.5' topographic maps.

1. All areas judged to have substantial overlook potential were classified as E. These included all areas lying within 400 m of a locally prominent high point or ridge crest and being no more than 20 ft lower in elevation than that ridge crest.
2. All areas were classified as S which lay adjacent to an R area, which possessed an average exposure of greater than 90 degrees east of north and of less than 270 degrees east of north, which possessed an average directed cumulative slope of more than 30 ft/mile, and which did not evidence organized drainage.
3. All areas were classified as N which possessed an exposure of less than 90 degrees east of north or greater than 270 degrees east of north, but which otherwise conformed to the definition of S areas.
4. All areas were classified as B which had not been classified as S, R, or N.

It should be noted that under these classification rules, almost all of WIPP Zones I and II would be classified as S; the remainder would be classed as R.

Because of the mobility of ridgelines through time in sand hill country experiencing substrate subsidence, it was thought that previous ridgelines should lie near to, but not necessarily on, existing ridgelines. It was judged that southerly slopes should be heavily sampled on account of their favorable solar and wind conditions. It was judged that basin contexts should be heavily sampled so as to maximize the likelihood of encountering water-related activity sites. It was judged that northerly exposures should be less heavily sampled on account of their unfavorable prevailing winds, poor solar exposure, and likelihood of recent aeolian cover. This result was achieved by biasing the rules for classification of sample units so as to ensure that preferably targeted terrain types were dominant in determining unit type.

Terrain with overlook potential has primary significance for site location which is out of proportion to its relatively small areal extent in the generally low relief characteristics of Zones III and IV of the WIPP project area. Because of the importance of ridgelines and knolls and the potential mobility of dune ridges over long periods of time, all quartersection units having more than 20% R were classified as R. Remaining units having more than 40% S terrain were classified as S. All remaining units with more than 40% B terrain were typed as B. Residual units were typed as N.

All quarter-section units lying partially or completely within Zones III or IV were then assigned sequential three-digit identifications, proceeding from west to east and filing from north to south. One hundred and twenty full or partial units were so numbered. Due to the irregular boundaries of Control

Zones III and IV, not all quarter-sections were fully included in the study area. The distribution of sample units of various sizes across the four terrain type designations is presented in Table 3.3. The resulting sample fractions and sizes are given in Table 3.4.

A random number table was consulted and sequential trinomials were drawn without replacement until the specified total unit area was drawn for each terrain class. As it happened, a 40-acre (0.25 unit) sample plat and an 80-acre (0.5 unit) plat were drawn for R, while a 100-acre (triangular) (0.63 unit) unit was drawn early in selection for S. As a result, the actual sample counts chosen were:

| | |
|---|-------------------|
| R | 4.75 units |
| S | 6.63 units |
| B | 3.00 units |
| N | 1.00 unit |
| | 15.38 units total |

for a total of 15.38 units or 2,460 acres.

Table 3.3 Number of Units by Type and Size, WIPP Assessment Study, ACOE, 1986.

| Approximate Area of Unit in Acres | Terrain Class | | | |
|--------------------------------------|-------------------------|-------|-------|------|
| | R | S | B | N |
| 160 | 32 | 36 | 19 | 6 |
| 120 | 4 | 6 | 0 | 0 |
| 80 | 1 | 2 | 0 | 1 |
| 40 | 3 | 8 | 2 | 0 |
| SUBTOTALS | 40 | 52 | 21 | 7 |
| TOTAL | 120 Units, of All Sizes | | | |
| Total Area in Quarter-Sections | R | S | B | N |
| Full | 32.00 | 36.00 | 19.00 | 6.00 |
| 3/4 | 3.00 | 4.50 | 0.00 | 0.00 |
| 1/2 | 0.50 | 1.00 | 0.00 | 0.50 |
| 1/4 | 0.75 | 2.00 | 0.50 | 0.00 |
| SUBTOTALS | 36.25 | 43.50 | 19.50 | 6.50 |
| TOTAL | 105.75 quarter sections | | | |

Table 3.4 Resulting Sample Fractions, WIPP Assessment Study, ACOE, 1986.

| Lumped Unit Terrain Class | Sample Unit Fraction | | |
|------------------------------|------------------------|---|-------|
| R | $\frac{36.25}{105.75}$ | = | 0.343 |
| S | $\frac{43.50}{105.75}$ | = | 0.411 |
| B | $\frac{19.50}{105.75}$ | = | 0.184 |
| N | $\frac{6.50}{105.75}$ | = | 0.062 |
| | TOTAL | | 1.000 |

Total acreage sampled should therefore be:

(In acres)

| | | | | | |
|---|-------|---|------------|---|-------------|
| R | 0.343 | x | 2405 acres | = | 824.9 acres |
| S | 0.411 | x | 2405 acres | = | 988.4 acres |
| B | 0.184 | x | 2405 acres | = | 442.5 acres |
| N | 0.062 | x | 2405 acres | = | 149.1 acres |

(In 1/4-section units)

| | | | |
|---|---|---|------------|
| R | 824.9 acres / 160 acres per 1/4 section | = | 5.15 units |
| S | 988.4 acres / 160 acres per 1/4 section | = | 6.17 units |
| B | 442.4 acres / 160 acres per 1/4 section | = | 2.76 units |
| N | 149.1 acres / 160 acres per 1/4 section | = | 0.93 units |

Conclusion:

Rounded to the nearest unit, we find the appropriate equiprobable sample counts should be:

| | |
|---|----------------|
| R | 5 units |
| S | 6 units |
| B | 3 units |
| N | 1 unit |
| | 15 units total |

3.4.1.2 Sampling Methodology - Zone V

Stratifications for WIPP Zone V (the proposed WIPP BLM Exchange) were developed according to the stratification procedures used for Zones III and IV. The results of the Zones III and IV sample survey indicate (Section 5.4) that sites are overwhelmingly present in R context or in those S and B contexts having local dune ridge development adjacent to playas, high ridges, or basins (Table 3.5). Within Zone V, no N areas are present under the Zones III and IV classification. 9.5 units are classified as R, 3 units as S, and 6.75 units as B.

Table 3.5 Sample Results, WIPP Zones III and IV, WIPP Assessment Study, ACOE, 1986.

| Sample Unit # | Terrain Type | Township/Range/Section | Portion Quarter | Area in Acres | # of Sites | # of IFs | Comments |
|---------------|--------------|------------------------|-----------------|---------------|------------|----------|---------------------------------|
| 6 | S | 22/31/9 | NE | 160 | 0 | 5 | Westerly Slope |
| 8 | R | 22/31/10 | (SW)NE | 40 | 1 | 0 | 80% R |
| 11 | B | 22/31/7 | SE | 160 | 0 | 2 | Westerly Slope |
| 28 | S | 22/31/15 | NE | 160 | 0 | 2 | Westerly Basin |
| 43 | R | 22/30/24 | (E)NW | 80 | 2 | 6 | Water, Overviews, Ridge |
| 44 | R | 22/30/24 | NE | 160 | 1 | 8 | Water, Overviews, Ridge |
| 45 | R | 22/31/19 | NW | 160 | 6 | 4 | Ridge & NW Overlook |
| 47 | S | 22/31/20 | (N)NW | 100 | 0 | 1 | No Overlook |
| 50 | N | 22/31/22 | NE | 160 | 0 | 0 | Gentle North-westerly Slope |
| 59 | R | 22/31/23 | SW | 160 | 2 | 0 | Ridge |
| 71 | S | 22/31/30 | SW | 160 | 0 | 5 | Mostly Basin, Gentle Slope |
| 96 | S | 22/31/32 | SW | 160 | 3 | 10 | Basin |
| 99 | S | 22/31/34 | SE | 160 | 6 | 6 | Southwesterly Steep Dune Fields |
| 101 | B | 22/31/34 | SE | 160 | 4 | 3 | Ridge, Basin |
| 102 | B | 22/31/35 | SW | 160 | 4 | 2 | Basin |
| 110 | S | 23/31/4 | NE | 160 | 1 | 1 | Westerly Steep Basin |
| 118 | R | 23/31/4 | SE | 160 | 4 | 4 | Linear Ridges |

R units lying in Sections 23 and 25, Township 21 South, appear from aerial photographs to represent portions of a large ovate Pleistocene or early Recent karst-controlled dunefield, fully stabilized at present. R units lying in Section 35 seem to represent a more recent or perhaps merely less well stabilized, ovate dune field, otherwise similar to the sections 23-25 system.

A third ovate dune field is present in Section 5, Township 22 South; this field is intermediate in degree of stability between the two fields to the northeast. All three fields are cut by old roads or trails, ensuring that some subsurface exposures are visible. All three fields contain terrain resembling that examined in Sections 23, 33, 34, and 35, Township 22 South, and Section 4, Township 23 South.

It should be emphasized that no obvious ovate high dune systems were sampled in WIPP Zones III and IV; nevertheless, the combination of high overlooks, sheltered lees, and large, well-watered interior basins or playas present in these three locations strongly suggested that high site densities might be expected, especially in:

Section 23, SE 1/4
 Section 35, SE 1/4, and
 Section 5, NE 1/4.

These units were purposively selected as probably the most site-rich units in Zone V.

The most nearly featureless unit present in WIPP Zone V is Section 1, NW 1/4. This unit possesses only about twenty feet of overall relief (slope < 1%); its terrain closely approximates the devoid units found in Zones III and IV: Section 9, NE 1/4; Section 15, NE 1/4; Section 22, NE 1/4; and Section 30, SW 1/4. Consequently, Section 1, NW 1/4 was selected as a unit probably devoid of cultural materials.

These expectations were largely borne out by field observations (Table 3.6); discussion of these observations is presented in Sections 5, 9, and 10.

Table 3.6 Sample Results, WIPP Zone V, WIPP Assessment Study, ACOE, 1986.

| Township/Range Section-1/4 | # of Sites | # of Ifs |
|-------------------------------|---------------|-------------|
| 21/31/35/SE | 2 | 2 |
| 21/31/23/SE | 2 | 5 |
| 22/31/01/NW | 0 | 5 |
| 22/31/05/NE | 2 | 8 |

4.0 SURVEY DESCRIPTION

4.1 INTRODUCTION

The purpose of field observational and analytical techniques adopted during the survey phase of this project was to locate, identify and usefully describe all cultural resources in the sampled units which could reasonably be detected from the surface. To this end, a comprehensive pedestrian survey was conducted over those units selected for sampling. Ancillary studies, including auger testing, test excavation, archival research, and interviews with local informants, were used to augment management data collected during the survey phase. These studies are discussed in chapters 6, 7 and 8 of the report.

4.2 SURVEY COVERAGE

Prior to the initiation of survey, site files in the Laboratory of Anthropology were consulted to determine if sites had been previously recorded from sampled areas. None was found. The only recorded site near the project area was LA 16633 (ENM 10408) which was located in the southwest quarter of T22S, R31E, Section 34, several meters west of the sampled boundary of the southeast quarter-section.

After completion of the records check, a Class II pedestrian survey was carried out on selected quadrant units. The crew consisted of four surveyors including a crew chief and assistant, a lithic technologist, and a ceramicist. To facilitate precise location of cultural resources encountered, sample unit corners and section corners were located and flagged. Distance between surveyors did not exceed 20 m. During each transect, the outside crew member set out a line of flagging which was paralleled in the return pass. This procedure insured uniform areal coverage. Transects were zigzagged to maximize coverage.

Artifact visibility was a problem. Dense stands of mesquite and shin oak over much of the project area made cultural materials difficult to see. Since dune blowouts increased artifact visibility, every blowout encountered was inspected.

4.3 DEFINITIONS OF SITES AND ISOLATED OCCURENCES

When an artifact or feature was encountered, transects were abandoned and surveyors searched for additional artifacts. An isolated occurrence was defined as any single or small cluster of artifacts including sherds, unutilized debitage, pre-World War II glass and metal containers, tools and isolated features, especially those judged to have experienced deflation or otherwise to have lost their original depositional context. Due to the problem of isolating single component sites in the area, the definition was interpreted narrowly. A small cluster of thermofacts or artifacts or any artifact associated with a feature was recorded as an I.O. only if, in the judgment of the crew chief, it had no more data potential. The primary factor in this determination was depositional situation. Generally, if less than

three artifacts were encountered in association, materials were recorded as isolates.

A site was defined as a cluster of thermofacts, artifacts, or artifacts and features thought to be in original depositional context or in a situation that suggested additional buried cultural materials were present in surrounding contexts. Sites, in contrast to I.O.s, were judged to have potential for further research. Three or more artifacts were generally recorded as sites.

4.4 RECORDING

4.4.1 Recording of Isolated Occurrences

Isolates were accurately plotted on orthophotographic and U.S.G.S. 7.5 minute maps. Attributes recorded for isolated artifacts included the frequencies and types of artifacts, the number and kinds of features, environmental situation and vegetation type.

4.4.2 Recording of Archaeological Sites

When an archaeological site was encountered, crew members converged and marked the locations of artifacts and features with color coded pin flags. Datum was established and marked with a 46 cm (18 inch) aluminum tagged rebar impressed with Mariah Project and field number (e.g., MA 235B- 1 through MA 235B-40). The rebar was driven into the ground with only the rebar top and metal tag left exposed on the surface. Datum served as a method of permanently identifying the resource by number and as a mapping station.

After these procedures were completed, crew members performed specific tasks. General environmental data, a description of horizontal site boundaries, site age, a description of the frequency and types of surface features, the nature of artifact assemblages, and depositional integrity were recorded on Laboratory of Anthropology Archaeological Site Survey forms. A primary concern during recording was to evaluate chronometric potential and the integrity and depth of archaeological deposits. To this end, some diagnostics were provenienced and collected. Since mixing of artifacts, deflation and deposition are major problems in this area, surveyors paid close attention to a site's geomorphological setting. In particular, surveyors documented the presence or absence of relict paleosols in the area. Surveyors took particular care to examine gullies or runoff areas for any evidence of deposition.

Surveyors also examined each site for evidence of structural features including hearths, storage cists, and pit depressions. Chronological problems in the area are well documented and the importance of C-14 samples cannot be overstressed. The problematic role of habitation structures in the area was also addressed with the identification of possible structures at LA 54363. Potential feature areas were mapped and considered for augering and possible test pit locations during the testing phase (see Chapter 6).

While crew chief and assistant mapped and documented sites, the ceramicist and lithic specialists performed in-field analysis. All artifacts not collected were returned to their exact locations. On sites with 50 surface artifacts or less, all artifacts were monitored. Because of their size, condition, and complexity, three sites of the 40 reported here were not totally characterized. LA 54390 (MA235B-34) consisted of an extensive and almost entirely eroded artifact and burned rock scatter lying on a bedrock slope cut by shallow, braided drainages. Careful inspection of the site led to the conclusion that only one small locus retained substantial evidence (stacked stone hearths) of integrity. This locus was mapped in detail and its artifact assemblage fully characterized. The remainder of the site was bounded and the bounds plotted.

LA 54363 (MA235B-7) and LA 54368 (MA235B-12) were found to consist of large and massively reoccupied sites contained in dune caps perched on hill slopes. In both cases, a large number of blowouts were found to contain very high concentrations (in some cases, as high as 50 items/m²) of artifacts and thermofacts. A decision was made to characterize in detail only selected representative areas of these sites. LA 54368 appeared to be composed of blowouts dominated by chipped stone, by ground stone and thermofacts, by mussel shell and groundstone, and by a mixture of all artifact categories. Consequently, a group of six blowouts was selected for mapping, their selection being guided by the field team's perception of those areas as both an accurate subset of the full range of variation in blowout contents for the site as a whole and also as a representative selection of high density areas for each of the apparent compositional types. All encountered features were plotted.

LA 54363, containing literally hundreds of thousands of artifacts and thermofacts scattered through perhaps 200 deep, linked blowouts, presented a difficult problem in recording. Discovered during the first field session, its topography was mapped from aerial imagery in the laboratory; this map was used to guide later field recording. Recording effort was focused on four linked blowout complexes which lay adjacent to a suspected jacal structure remnant. Overall density and density variation was recorded by transects across these blowouts for chipped stone, groundstone, ceramics and thermofacts. Only features located within these blowouts were plotted.

Total mapping of this site would entail a massive field effort. It would clearly require extensive research design, aerial photogrammetric mapping, multistage sampling and unavoidable site disturbance and publicity. Complete mapping alone would thus demand more effort than most fully mitigative field treatments of sites subjected to total impact, and clearly much more effort than is appropriate to a Class II survey study.

In all cases, surface features with chronometric potential were targeted for subsequent test excavation. All sites were photographed in color and in black and white as a routine aspect of survey recording.

A plan view map was produced for each site to depict the relation of the site to nearby physiographic features, the location of cultural features, the

extent of scatter, datum location, and the location of sampling units. Locations of collected diagnostics were also plotted on plan view maps.

Three classes of artifacts including lithics, ceramics and historical artifacts were subjected to in-field analysis. Examples of forms used are included in Appendix A. Lithic types monitored included debitage, cores, formal tools, and groundstone. Debitage attributes observed included material type, source, material texture, debitage type (flake, angular debris or bipolar debris), flake type (whether flake was struck from core or biface), portion, percent cortex, platform type, number of obviously utilized edges, and number and type of retouched edges. Material, source and texture were also monitored on cores and formal tools. Other core attributes observed on cores included type of core, whether its flake potential was exhausted, whether or not it was reused as a tool, and condition. Additional attributes recorded on tools included type of tool, portion, condition and whether or not it appeared to have been recycled. Attributes monitored on all groundstone artifacts were artifact type (metate, mano, pestle, or unidentified groundstone), material type, portion, and condition (burning, shaping, erosion). Additional attributes recorded for identifiable or complete items were dimensions, texture, overall shape (basin or slab metate, one hand or wedge mano), morphology (bifacial or unifacial), and cross section (plano, convex, or concave).

Ceramic in-field analysis was designed to allow distinctions among Jornada Mogollon brownwares of types based on size, color, and mineralogical identity of tempering agents; nature of surface finish; and paste color (Anyon 1985; Arany 1977; Burns 1977, 1980; Frizell 1985; Kyte 1984). Possible temporal significance of painted, tooled, or textured ceramics and Jornada/El Paso brownware rims (Whalen 1978, 1980, 1981) led to their collection. Observations made in the field permitted multivariate statistical evaluation of attributes comparable to those recorded in more detailed laboratory studies.

A historical artifact form is included in Appendix A. The form is a checklist. Cans were to be typed as to content as was bottle glass and other container categories. Historical artifacts were also to be monitored as to temporal attributes. For instance, a can might be typed food can with lapped seam or food can with solder top. Any makers' marks were to be sketched.

Diagnostic artifacts were collected when data potential remained after in-field analysis. Diagnostics minimally include projectile points, certain ceramics, and obsidian. (The only obsidian encountered was a scraper, collected from the surface). Projectile points and ceramics are, of course, temporally sensitive artifact types.

4.5 CREW COMPOSITION AND TIME EXPENDED

Survey was carried out over an area of approximately 3,060 acres during November and December of 1985 and February of 1986. The crew for the first session was composed of John Acklen (Principal Investigator and Lithic Analyst), Jack Bertram (Field Director and Ceramic Analyst), James Enloe (Crew Chief), and Karen Kramer (Archaeologist). The crew for the second session was

composed of Jack Bertram (Field Director), Jon Frizell (Crew Chief and Lithic Analyst), Amy Earls (Ceramic Analyst), and Steven Hoagland (Archaeologist). The crew for the third (Zone V) was composed of John Acklen (Principal Investigator and Archaeologist), Jack Bertram (Field Director and Ceramic Analyst), and David McGuire (Lithic Analyst).

5.0 SURVEY RESULTS

5.1 INTRODUCTION

Forty new sites and 75 isolated artifacts was recorded in the course of the Class II survey of WIPP Zones III-V. Site densities ranged from zero to as many as 26 per square mile, but this figure is inadequate to convey the complexity of site patterns encountered. Site size ranged from a few square meters to on the order of half a million square meters. Total site richness ranged from a few artifacts and thermofacts to perhaps a million such visible items per site. The sites encountered fit no simple typology. Only the smallest may reasonably be held to represent single occupational units. We suspect that many of these are in fact large sites which remain undeflated or which have been reburied by the incessant aeolian movement which characterizes the area. As a consequence, our estimates of site extent, site content, and site intactness should probably be viewed as minimum estimates; evidence to be presented below and in following chapters strongly suggests that we saw only a small part of the cultural material actually present in the WIPP project area.

Newly-discovered sites are presented here in the order of their recordation. General locational information is presented along with each site description (refer also to Figure 2.2). Exact site location maps are on file at ACOE-Albuquerque, at the Laboratory of Anthropology-Santa Fe, and at Mariah Associates, Inc., Albuquerque. Lithic artifact attributes summarized in Section 5.4.1 and in Appendix C tables.

5.2 SITE DESCRIPTIONS

5.2.1 Site: MA-235B-1; LA 54357

Location: T22S, R31E, S10, NE 1/4

Previous Study: None

This site is a sparse lithic and ceramic scatter, located below a hill crest overlooking plains to the south and west.

The site is composed of two areas. A northern sherd and chipped stone scatter had an associated Middle or Late Archaic point; all materials were eroding from the face of a high, stabilized dune. A southern area was composed of scattered, burned caliche fragments and a metate fragment, located in two blowouts in a low dune or aeolian sheet deposit.

No definite features were seen; hearths may be present in the southern area.

The recorded lithic assemblage included 10 pieces of debitage, one point and a groundstone fragment. Of the debitage, three pieces were angular debris; the seven flakes were all determined to be core flakes. Five (71%) of the flakes had no cortex and two (29%) had 31-70% cortex. No retouch or utilization was noted for 70% of the debitage. One specimen (10%) was

utilized and two (20%) were unidirectionally utilized and retouched. Thickness values on complete flakes varied evenly from 1 mm to 18 millimeters. Cherts composed 90% of the debitage material types. One artifact was of silicified sandstone.

The few nondebitage lithic items were as follows. A complete chert late Archaic projectile point was collected (see Lithic Appendix, artifact 1). The groundstone sample consisted of a sandstone slab metate fragment (see Appendix C-6). No biface reduction evidence was observed.

This site contained two sherds, an El Paso jar and a Jornada Plain Brown bowl sherd. These sherds date the site to the A.D. 200-1350 period, covering the Hueco, Querecho, and Maljamar phases in Leslie's (1979) classification.

No bone or shell was seen on this site.

The presence of both an early point and later ceramics in the steep blowout side slope of the northern area strongly suggests the presence of one or more depositional units, which may bear intact cultural levels, within the uneroded bulk of the northern dune. The observation of both burned caliche and also possible soil from a darker paleosol in rodent burrow spoil piles in the southern area may indicate that the few artifacts and thermofacts seen in that area were brought up from a richer underlying cultural deposit. The site is thought to be more than 50% intact.

5.2.2 Site: MA-235B-2; LA 54358

Location: T22S, R31E, S32, SW 1/4

Previous Study: None

This site is a sparse burned rock, ground stone, and chipped stone scatter.

The site is composed of one scatter of chipped stone, ground stone, and burned caliche lying in a blowout, together with isolated ceramic and burned or groundstone items lying in adjacent arms of the same blowout.

No features were noted.

The observed lithic assemblage included three debitage specimens and three groundstone fragments. Of the debitage two pieces were classified as core flakes, and one as a biface flake. Two flakes had no cortex present. One core flake retained 10% cortex. None of the flakes was retouched or utilized. Two of the complete flakes were less than 3 mm in thickness. All debitage was manufactured from chert. The three groundstone artifacts inventoried were sandstone metate fragments.

One plain brownware sherd was found.

No bone or shell was noted.

Some potential for in-situ deposits is present in stabilized relict pediments to the north of the main scatter and in dunes to the south and east. The degree of site integrity is unknown but possibly high.

5.2.3 Site: MA-235B-3; LA 54359

Location: T22S, R31E, S32, SW 1/4

Previous Study: None

The site is a burned caliche and burned sandstone scatter, with one associated sherd and one flake.

The site is present in two adjacent blowouts. The westernmost blowout exhibits scattered burned sandstone to the southeast and scattered burned caliche to the northwest. The easternmost blowout contains one or more scatters of almost exclusively burned caliche.

Probably three or more deflated hearths are visible; functional differences between these may be indicated by clear dominance of caliche over sandstone.

One lithic item, a chert biface flake with no cortex, was recorded from this site. It was neither retouched nor utilized. Thickness was not recorded because of its incompleteness. This was one of 10 sites in the project area that yielded no groundstone.

One El Paso Brown jar sherd was found.

Neither bone nor shell were noted at this site.

The increased density of burned rock well up the eastern and western lateral faces of the dune which separates the two side blowouts probably indicates buried hearth features or deposits within the dune. It is possible that the site is 50-75% intact.

5.2.4 Site: MA-325B-4; LA 54360

Location: T22S, R31E, S32, SW 1/4

Previous Study: None

This site is a burned caliche scatter with associated ceramics and lithics, located in two adjacent and very deep blowouts.

The southern site area contained only burned caliche, while ceramics dominated the northern blowout.

The only possible feature noted was the southern burned caliche scatter, which probably indicates a deflated hearth.

The recorded lithics included a debitage item and a hammerstone. The silicified sandstone core flake retained 60% cortex. It was utilized and measured 4 mm in thickness. The small hammerstone exhibited facets from

battering. It was made of a coarse grained sandstone pebble. This site is one of ten in the project area that yielded no groundstone.

The site produced five sherds, all of which are probably Ochoa Brown Indented jar sherds. This type probably dates to the period A.D. 1000- 1400, it suggests site occupation during the Maljamar or Ochoa phase (Leslie 1979:192).

Neither bone nor shell was noted on this site.

The northern blowout is very deeply deflated, while the southern blowout is relatively shallow. This comparison suggests that, if the sherd and caliche scatters are contemporaneous, the northern materials have been severely deflated. Potentially intact deposits may, of course, occur in adjacent dunes. Perhaps 25% of the site remains intact.

5.2.5 Site: MA-235B-5; LA 54361

Location: T22S, R31E, S23, SW 1/4

Previous Study: None

This site is composed of several burned caliche and lithic tool scatters dispersed along the east face of a north-south dune, together with a series of possible structural alignments of unburned caliche exposed on an outcrop to the west. As these alignments lie directly on deflated caliche bedrock, their cultural significance is probably no longer assessable.

Subareas of the site include: the western area of possible structural alignments, with apparently no associated artifacts; a northern area with formal tools present; a central area with scatters of burned caliche; and a southern dispersed burned caliche scatter.

Possible features include, at minimum, a central hearth area, now partly deflated, and the possible structural area to the west.

The recorded lithic assemblage included three pieces of debitage, and two tools: a point and a scraper. The debitage sample consisted of only core flakes. Two of them retained less than 20% cortex, while one flake had no cortex. Two flakes exhibited no edge modification. One specimen was utilized. The one flake that could be measured was 15 mm thick. Debitage material types included chalcedony (67%) and silicified wood (33%).

Nondebitage items included a complete chert Scallorn projectile point which was collected (see Lithic Appendix, artifact number 2). The scraper is a composite tool of silicified wood. One edge was utilized for cutting and exhibited bidirectional wear. This site is one of ten in the project area that contained no groundstone specimens.

No ceramics were encountered on this site.

No bone or shell items were encountered on this site.

Potential significance of the possible structural alignments in the western area can only be assessed by testing, geological analysis, and statistical study. Depositional integrity of the three eastern subareas is probably variable and restricted to dune pediments and the shallower blowouts. The site may be 75% intact.

5.2.6 Site: MA-235B-6; LA 54362

Location: T22S, R31E, S23, SW 1/4
Previous Study: None

This site consists of four or more loci exposed in at least 13 blowouts along the eastern slopes and crest of a northwestward-trending dune ridge (Figure 5.1). Various loci contain quantities of burned caliche, ceramics, lithics (both chipped and ground), and intact hearths indicated by dense ash in rodent and carnivore burrows.

The northernmost locus, A, consists of two blowouts with lithics and burned caliche scatters. Locus B lies southwest of Locus A; it consists of five blowouts with scattered burned caliche and brownware jar sherds. Locus C, southeast of B, consists of two large blowouts with sherds, lithics, and burned caliche scatters. Locus D, northeast of C, is a single blowout with extremely dense burned caliche scatters, lithics, and at least one brownware sherd. Locus E, east of C and D, extends across two blowouts; the first is densely littered with burned caliche, groundstone, chipped stone, and brownware sherds, including at least one Red-on-brown or Red-on-terracotta sherd, while the second blowout contains at least one as-yet-unexposed hearth evidenced by ashy spoil in a badger burrow in the blowout bottom. Locus F, north of D and E, contained one lithic, one caliche mano, and Red-on-brown or Red-on-terracotta sherd.

Artifactual scatters in Loci C, D, and E are probably dense enough to merit feature designation. In addition, the ash lens or hearth complex underlying the Loci C and E shallow blowouts is certainly featural.

The recorded lithic assemblage was 75% debitage. In addition a scraper, a core and five groundstone pieces were itemized. Eight of the 21 debitage pieces were angular debris. Of the 13 flakes, 12 (92%) were core flakes, and one a blade flake. This is one of four blade flakes recorded in the project area. No cortex was present on 50% of the flakes. Among the remaining flakes, cortex percentages were evenly distributed between 10 and 100% presence. No edge modification was noted for 81% of the flakes. Utilization was observed in 14% of the specimens. One flake (5%) was unidirectionally modified and showed edge damage. Of the flakes for which thickness was measurable, 50% were less than 3 mm. Other flakes varied in thickness up to 18 millimeters. Diverse debitage material types were represented, including cherts (71%), silicified sandstone (9%), siltstone (5%), silicified wood (5%), chalcedony (5%), and andesite (5%).

An exhausted chert core was one of two nondebitage chipped stone items. Flake removal resulted in a multifaceted surface morphology. A scraper was manufactured from white chert and was unifacially retouched.

MA235B-6
LA54362

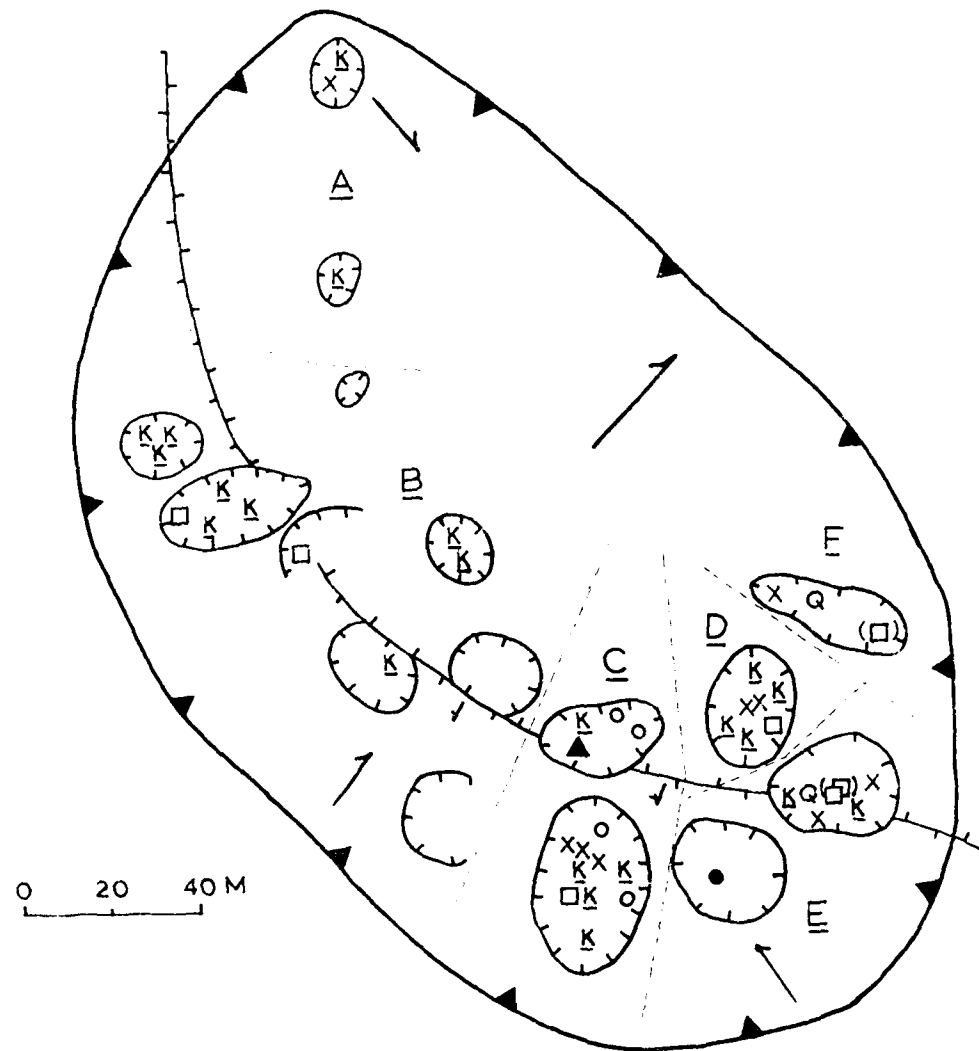


Figure 5.1 MA235B-6/LA, WIPP Assessment Study, ACOE, 1986.

The groundstone sample included three sandstone slab metates. All were broken and burned. A sandstone mano was unifacially ground, while the caliche mano was bifacially ground. This site is notable for its flake utilization.

This site contained eight sherds. These were an El Paso Brown jar, three indeterminate brownwares with eroded surfaces, one Jornada Plain Brown, and two San Andres Red-on-terracotta. These types may date the site to the period A.D. 200-1350, covering the Hueco to Maljamar phases.

Neither bone nor shell was observed on this site.

It is probable that substantial deposition is present in the dune pediments separating blowouts in Locus A and B. The Loci C-D-E cluster clearly has extensive and relatively rich deposition in dune pediments (by interpolation) and also contains areas which have only begun to deflate. Under these, cultural deposits of high potential integrity are known to exist, as animal burrow spoil piles within them were ashy or contained charcoal. As a result, the site is thought to be 80% intact.

5.2.7 Site: MA-235B-7; LA 54363

Location: T22S, R30E, S24, NW 1/4

Previous Study: None

This site is a large occupational complex exposed in many deep blow-outs along the top, slopes, and base of a dune-capped ridge (Figure 5.2). Materials include burned caliche, burned sandstone, groundstone, chipped stone, and ceramics. Densities in some blowouts range up to 20 items per square meter (Figure 5.3).

As only a small percentage of the surface area of this huge site could be monitored, no clear site structure could be defined. However, it appears that the highest concentrations of materials are present in the southwest and central portions of the site.

Numerous ash lenses or hearths were noted which appeared to possess integrity. In addition, a caliche cobble-footed and cobble-masonry structure of perhaps four rooms appeared to be present (Figure 5.4). Testing was required to evaluate the age and integrity of this feature.

The recorded lithic assemblage included 49 debitage artifacts, two projectile points, one core, a hammerstone, a chopper and 34 groundstone implements. The site's size is 2.75 times greater than the next largest site, extending over 330,000 m². Visible artifacts could not be completely monitored. Instead, a series of three connected blowouts east of the datum were selected to be inventoried. The lithic sample was intended to meet levels of recording intensity required by the Army Corps of Engineers, and does not represent an unbiased or representative sample. Consequently, the groundstone assemblage was monitored over a larger area than was the more abundant chipped stone. The high reported ratio of groundstone to chipped stone may reflect the biased sample.

MA235B - 7
LA54363

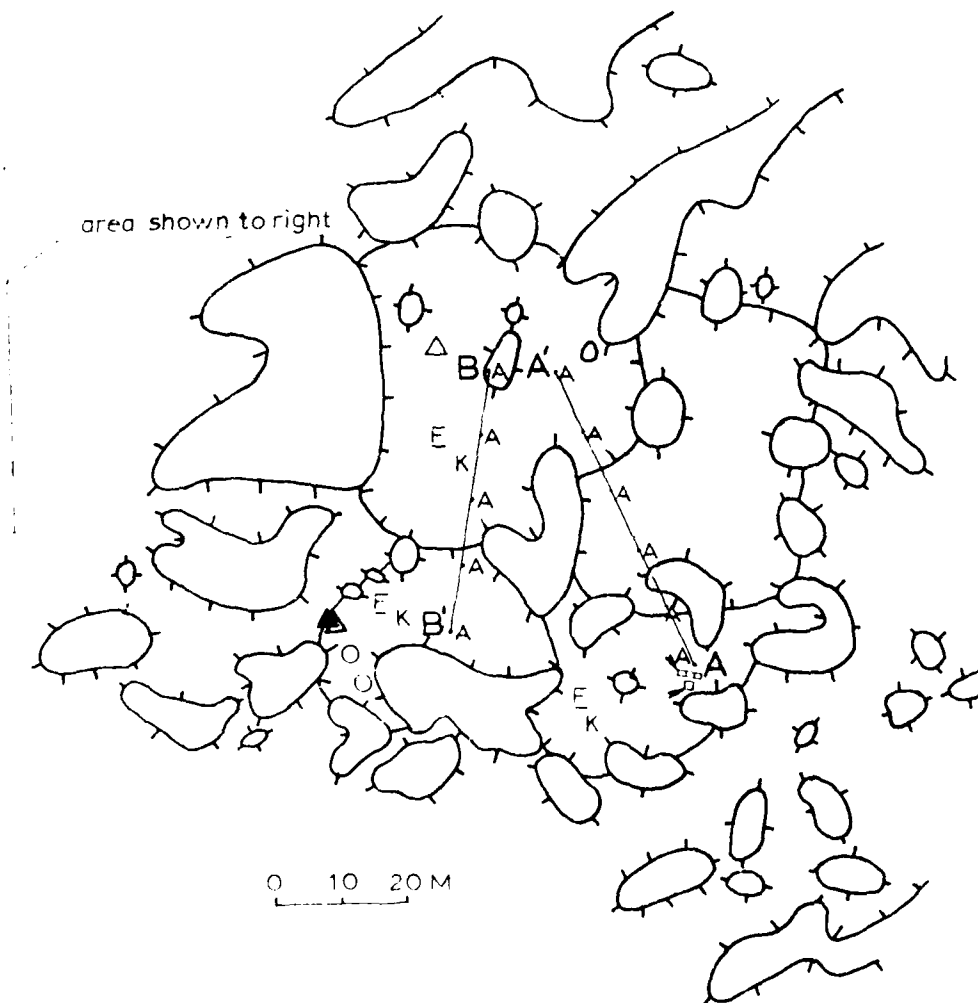
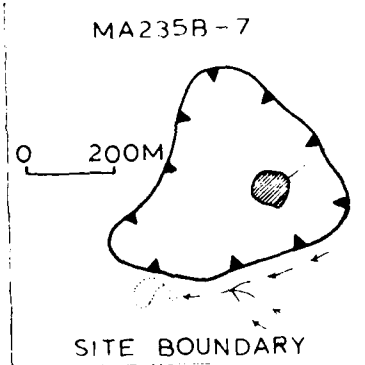


Figure 5.2 MA235B-7/LA 54363, WIPP Assessment Study, ACOE, 1986.

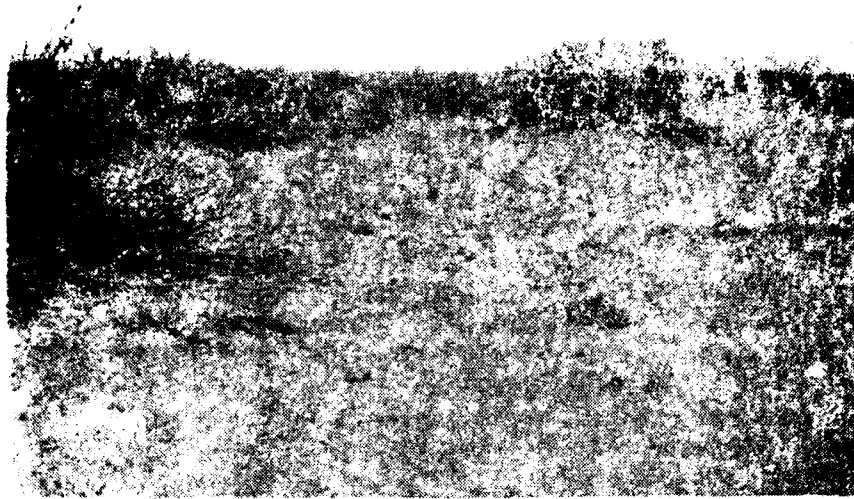


Figure 5.3 Artifact Density on LA 54363; All Visible Objects are Either Artifactual or Thermofactual, WIPP Assessment Study, ACOE, 1986.



Figure 5.4 Caliche Surface Alignments on LA 54363, WIPP Assessment Study, ACOE, 1986.

The debitage sample represented 57% of the assemblage and consisted of 13 core flakes, 16 biface flakes, 10 unknown flakes, and 10 angular debris fragments. Of the flakes 87% had no cortex present on the dorsal surface. Other cortex presence values varied from 10% to 100%. No edge modification was noted for 98% of the debitage. One flake was bidirectionally retouched and utilized. Sixty-five percent of thickness values were greater than 3 mm, and 35% were less than 3 mm. The debitage material type range included silicified sandstone (35%), cherts (29%), chalcedony (26%), caliche and limestones (4%), jasper (2%), basalt (2%) and rhyolite (2%).

Tools included a chert and a chalcedony projectile point, both collected (see Lithic Appendix, artifact numbers 3 and 4). An exhausted chalcedony core was recorded. The flake removal method produced a multifaceted surface morphology. A limestone chopper featured battering on both ends. A caliche hammerstone was recorded, also.

The groundstone sample included 14 manos, 11 metates and 9 unknown groundstone fragments. Ninety one percent (91%) of the groundstone implements were manufactured from sandstones, much of it being fine grained. Three (9%) specimens were produced from caliche. Of the manos, 57% were unifacially ground, while 43% exhibited bifacially worked surfaces. All metates displayed unifacially ground use wear. Of those metates that were identifiable, three could be classified as basin and two as slab metates.

This site produced 34 sherds in the three blowouts monitored, the highest frequency and greatest variability in ceramics from any site on the present WIPP survey. The sherd types were: El Paso and Jornada Brown, indeterminate brownware, El Paso painted, Chupadero whiteware, San Andres Red-on-terracotta, South Pecos Brown, and San Francisco Red. The ceramic dates span the period A.D. 200-1450 and indicate long, although not necessarily continuous, occupation at the site throughout the Hueco, Querecho, Maljamar, and Ochoa phases (Leslie 1979:189). The exposure at the present site surface of this wide range of types in only a small portion of the site reflects the probable overlapping spatial extent of many separate occupations.

At least one cluster of freshwater mussel shell was observed in the northern portion of this site. No archaeological bone was noted.

There can be no question that substantial quantities of cultural material are present in depositional context on this site. Assessment of deposit integrity is more problematic, as the hundreds of thousands of cultural items present indicate substantially more than one occupational event. In this case, it may prove very difficult to distinguish occupational components, unless isolated units of high stratigraphic integrity can be located. Overall, the site is judged to be 65% intact.

5.2.8 Site: MA-235B-8; LA 54364

Location: T22N, R31E, S19, NW 1/4

Previous Study: None

This site consists of three or more articulated rock hearths, several fragments of groundstone, several pieces of debitage, and a sherd. It lies between braided stream channels on a red-brown paleosol hardpan (Figure 5.5).

No clear subareas were seen; the artifact scatter lies around and to the south of the three articulated hearths.

Features include three and possibly four piles of burned cobbles representing surface hearths or the fill of eroded pit hearths.

The lithic assemblage included two pieces of debitage and three groundstone fragments. The debitage sample consisted of one core flake and one angular debris fragment. The flake's dorsal surface retained 100% cortex. One debitage specimen had no edge modification; the other was utilized. Both artifacts were manufactured from cherts. The groundstone sample consisted of three sandstone metate fragments. One fragment was burned.

The site had only one sherd, Jornada Plain Brown, dating the site to the A.D. 200-1350 period, covering the Hueco, Querecho, and Maljamar phases.

Neither bone nor shell was found on this site.

Deposition may be present beneath the blowout surface; deposition probably is present in two pediments immediately east of datum. The fact that hearth piles remain in articulation strongly suggests that this site has not undergone any significant erosional cycle prior to the cycle presently occurring. The site is judged to be 25% intact.

5.2.9 Site: MA-235B-9; LA 54365

Location: T22S, R31E, S19, NW 1/4

Previous Study: None

This site closely resembles the nearby site LA 54364 (above) in that it contains articulated/rock-filled hearths lying on a red-brown paleosol hardpan. Lithics are relatively much more common on LA 54365, however, and only two hearths are clearly indicated.

No subareas are indicated by surface artifact scatters; the single lithic concentration, the articulated hearth, and the semiarticulated hearth all lie close together.

Three features are evident at this site. They include an articulated stone-filled hearth at the northeastern site boundary, a partly disarticulated stone-filled hearth some seven meters to the west, and a lithic concentration lying between the hearths and a few meters to the south.

MA235B-8
LA54364

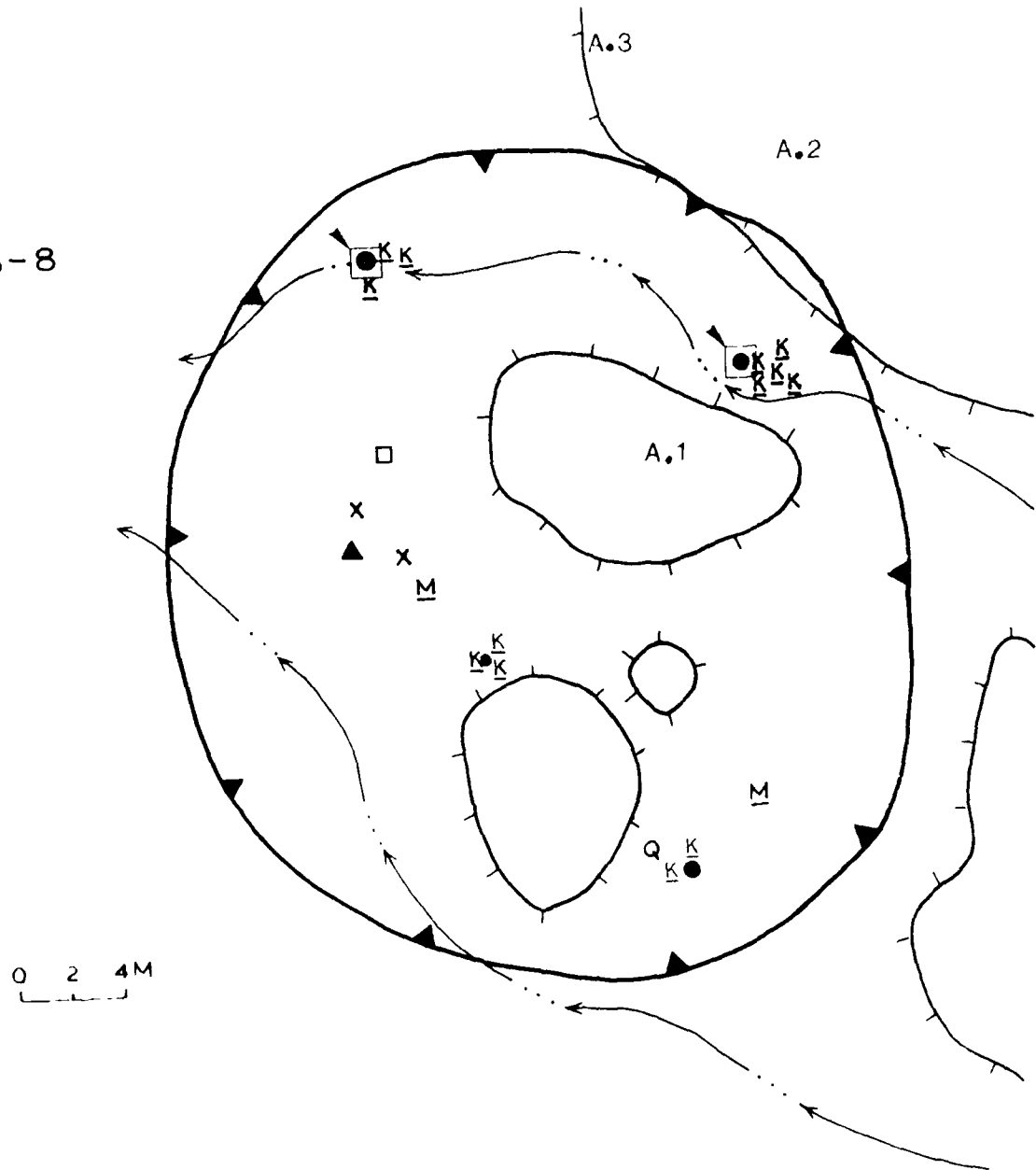


Figure 5.5 MA235B-8/LA 54364, WIPP Assessment Study, ACOE, 1986.

The inventoried lithic assemblage consisted of nine debitage items and one core. The debitage consisted of six (67%) core flakes and three (33%) blade flakes. No cortex was present on 67% of the flakes. In the remaining sample, dorsal surface cortex varied from 15% to 100% coverage. Only one (11%) of the flakes was utilized; the remainder exhibited no use or alteration. Of those flakes that were measurable, thickness ranged between 2 mm and 12 mm. Debitage material type varied, including cherts (55%), quartzites (22%), chalcedony (11%) and silicified wood (11%). The chert core was produced by a unidirectional flaking technology from a single platform. It was considered exhausted. This is one of ten sites in the project area that did not yield groundstone implements.

No ceramics were encountered on this site.

Several fragments of artiodactyl (deer, antelope, or sheep) tooth enamel were recognized on this site; they lay to the south of the main concentration and well up the side of a dune pediment which suggests that they may not be culturally associated.

The depositional integrity of this site appears to have been impacted by deflation except in the far west end of the site. As with site LA 54364, it appears that the eastern portion of the present blowout floor closely approximates the original occupation surface of the site. Deposition is also probable beneath dune pediments to the north, south, and east of the feature area. Intactness of deposits is impossible to assess without substantial testing.

5.2.10 Site: MA-235B-10; LA 54366

Location: T22S, R31E, S19, NW 1/4

Previous Study: Uncertain; possibly associated with old pipe-line work.

This site consists of lithic, groundstone, and burned rock scatters, together with five or more articulated or partly articulated hearths, exposed in and on a red-brown hardpan which forms the floors and walls of blowouts in a dune which caps a low ridge (Figure 5.6). A historical scatter is also present.

Although visibility on this site was limited to disturbed areas, it appeared that hearths tended to occur in the western and central portions of the site, historical (1900s) trash occurred at the southwestern site extreme, and debitage was mostly present in the northern and southern lower elevations well off the ridge crest.

Features include five or more hearths, of which one articulated example is associated with and composed of metate and mano fragments, while two other examples appear to be eroding out from well below the top of a red-brown paleosol unit.

The monitored surface lithic assemblage included debitage, a core, a projectile point, two scrapers, two denticulates, and three groundstones. Of

MA235B-10
LA54366

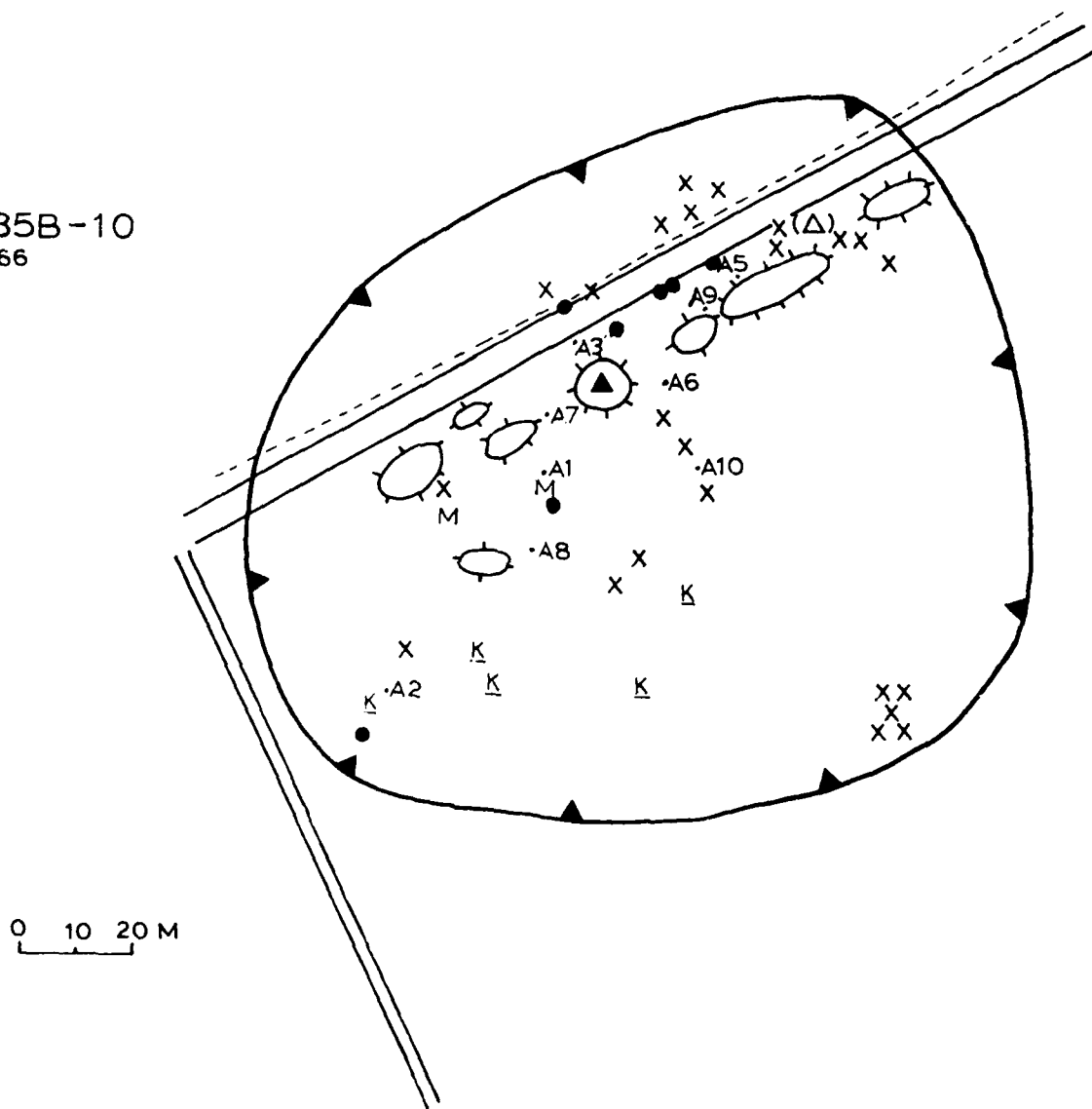


Figure 5.6 MA235B-10/LA 54366, WIPP Assessment Study, ACOE, 1986.

the debitage, 12 pieces (80%) were core flakes. One blade, two biface flakes, and three pieces of angular debris were recorded. Less than 30% cortex was present on 75% of the flakes. No retouch or utilization was noted on 95% of the debitage; one flake was unidirectionally retouched. Thickness varied in the measurable flakes, while 57% of them were between 3 mm and 6 mm. The debitage was produced from a diversity of material types. Cherts represented 55% of the distribution. Quartzites (22%), chalcedonies (11%), silicified wood (6%) and siltstone (6.9%) were noted. The chert core exhibited nominal bidirectional flake removal and was classified as a tested pebble.

A chert projectile point base was collected (see Lithic Appendix, artifact number 5). Three scrapers and one spokeshave were inventoried; all were complete and manufactured from chert. The groundstone sample consisted of two sandstone slab metates and one wedge shaped mano.

No ceramics were encountered on this site.

Neither bone nor shell was noted in association with this site.

A sparse historical scatter including a hole-in-top can, weathered timber, and rusted tinplate was noted.

The discovery of a probable Middle or Early Late Archaic point, the presence of substantial debitage, the absence of ceramics, and the recognition that apparently intact features were weathering out from within a deep paleosol unit all suggest that this site may contain intact, rather early, and deeply buried deposits. The site's integrity has been impacted by the emplacement of a pipeline and associated road across its northern end, but the southern and central areas probably contain substantial cultural deposits of high potential research value. The overall site intactness is thought to be 50%.

5.2.11 Site: MA-235B-11; LA 54367

Location: T22S, R31E, S19, NW 1/4

Previous Study: None

This site is composed of sparse, dispersed scatter of chipped lithics, groundstone, burned caliche, and ceramics; it is distributed throughout several blowouts along and adjacent to a low ridge top.

A partly articulated hearth was noted 90 m to the east of datum, while lithics mostly occurred 30-60 m west of datum. It is probable that the site represents several episodes of use, associated with the minimal shelter and overlook provided by the low ridge crest.

The only probable feature found is the semiarticulated stone-filled hearth located at the northeastern site margin.

The monitored lithic assemblage was 90% debitage. In addition, one anvil and one eroded mano fragment were recorded. The debitage included 15 flakes and 2 angular debris fragments. Within the flake sample 14 (93%) were core

flakes. Only one biface flake was recorded. No cortex was present on 73% of the flake specimens. Cortex percentages varied evenly on the remaining flakes. Only two pieces of debitage were utilized. The other 15 (88%) were neither retouched nor utilized. Thickness values ranged from 2 mm to 8 mm. Cherts represented 82% of the debitage material types. Other materials included quartzite (12%) and chalcedony (6%). The limestone anvil was complete and exhibited unifacial pitting from battering on the central surface. The sandstone mano exhibited no use wear.

This site produced two sherds, one Jornada Brown sherd and a Chupadero whiteware jar sherd. Together, these sherds would suggest occupation sometime in the A.D. 200-1450 range, covering the Hueco to Ochoa phases.

No shell or bone items were encountered on this site.

Cultural deposits in context are probably present sporadically throughout the uneroded portions of this site in dune pediments. The absence of any evidence of hardpan or paleosols may render stratigraphic interpretation difficult in the event this site is tested. Site integrity is high but difficult to estimate without testing.

5.2.12 Site: MA-235B-12; LA 54368

Location: T22N, R30E, S24, NE 1/4

This site, like LA 54363, is a very large complex of deep and shallow blowouts containing quantities of burned caliche, groundstone, chipped stone, ceramics, shells, and some intact features. It was monitored by determining its extent and by mapping and recording selected areas of high concentration (Figure 5.7).

Definable site structure is limited to an apparant concentration of milling stones and groundstone debris in the central area of the site, with most chipped stone occurring in the highest (i.e., southwestern) portion of the site.

Features include an articulated, stone-filled hearth near datum, at least two concentrations of mussel shell, a probably intact hearth at the western site boundary (in the road), and probably many more hearths, suggested by numerous burned caliche scatters.

The observed lithic assemblage yielded 22 debitage items, 1 projectile point and 9 groundstone artifacts. Visible chipped stone artifacts were monitored only in one blowout that had a significant concentration of artifactual remains.

The debitage included 16 (73%) core flakes, 3 (14%) biface flakes and 3 (14%) pieces of angular debris. All recorded flakes had less than 30% cortex with 79% of them having no cortex present. None of the debitage was utilized or retouched. Thickness values were distributed evenly from 1 mm to 14 mm. Material types were represented by cherts (48%), chalcedonies (24%), quartzite (19%), basalt (4%), and limestone (4%).

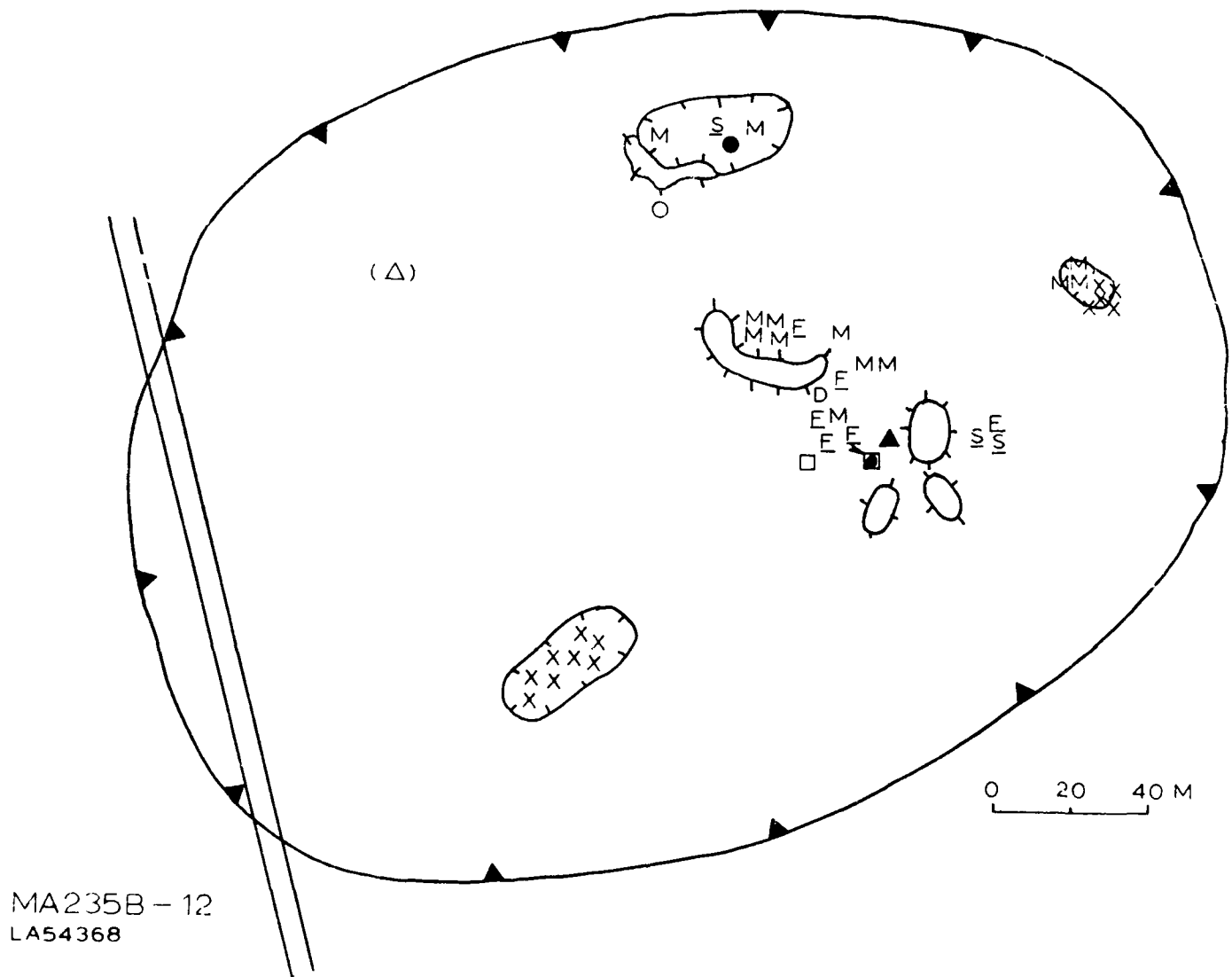


Figure 5.7 MA235B-12/LA 54368, WIPP Assessment Study, ACOE, 1986.

A complete chert Archaic projectile point was collected (see Lithic Appendix, artifact number 6).

The groundstone sample included seven manos and two metates (see Appendix C-6). All groundstones were manufactured from sandstone. Use wear and technology varied widely in extent of surface preparation and use.

The site produced six sherds, half Jornada Brown jar and half El Paso Polychrome jar sherds. These sherds, some of which are probably from the same vessels, date the site occupation to the A.D. 900-1350 period and the Hueco to Maljamar phases.

At least two concentrations of freshwater mussel shell fragments were noted on this site; in both cases, at least three or four individual mussels are represented. No manufacturing debris was visible.

As with site LA 54363, this site possesses very substantial research potential complicated by its obvious multicomponency. Diagnostics encountered indicate a possible range of ages for occupation from at least the Middle Archaic period through at least the Middle Ceramic period. The presence of dense materials in sand-floored blowouts adjacent to intact features lying in or on deeper paleosols strongly indicates that superimposed deposits may be confidently expected. Overall site integrity is thought to be 70% intact.

5.2.13 Site: MA-235B-13; LA 54369

Location: T22S, R31E, S34, SE 1/4

Previous Study: Probably an extension of Schermer's (1979) sites LA 16632 and La 16634 are contiguous.

This site is a burned rock, ceramic, debitage, and groundstone scatter distributed across several blowouts along the eastern slope of a dune-capped ridge.

The site is divisible into four loci. Locus A lies in the northeastern portion of the site and contains four blowouts which exhibit burned caliche, burned sandstone, lithics and ceramics. Locus B lies in the southeastern portion of the site, and contains one blowout with burned sandstone, caliche, and flaked items. Locus C lies upslope to the west of Locus B, and consists of one blowout with debitage. Locus D lies upslope to the north of Locus C, and consists of four small blowouts, which contain Chupadero B/W sherds, a metate fragment, debitage, and burned caliche. Some distance upslope to the west (out of the sample area) more materials are known to occur, including several hearths. These were not monitored.

No intact features were encountered within the site area, although several concentrations of burned rock were noted in Loci A and B.

The recorded lithic assemblage included 14 pieces of debitage, 1 core, 1 uniface and 11 groundstone specimens.

The debitage inventory contained nine (64%) core flakes, four biface flakes and one piece of angular debris. No cortex was present on 77% of the flakes dorsal surfaces. None of the debitage exhibited edge modification. Of the measurable flakes, all thicknesses were less than 6 mm, while 50% were less than 1 mm. Debitage materials included 37% chalcedony, and 21% each of chert, quartzite and silicified wood.

The sandstone conglomerate core was produced by multifaceted flake removal. The core was utilized, exhibiting battering along one edge. The uniface was manufactured from chert; step fracturing along the denticulated edge was noted.

The groundstone sample included six manos, two metates, and three unidentified fragments (see Appendix C-6). All were manufactured from sandstones. Two of the manos were wedge shaped and one metate was basin shaped, suggesting extensive and curated use. Several of the groundstone specimens were fire cracked or burned.

This site contained five jar sherds, one Jornada Brown, three Chupadero Black-on-white, and one El Paso painted ware. The Chupadero sherd included one misfire and two with creamier slips than are considered typical in the north. The sherds date the site to the A.D. 200-1450 period, covering all four occupational phases.

Neither bone nor shell was noted on this site.

It appears likely that this site constitutes a southeastward extension of site LA 16632 (Schermer 1979:1419); if, as is suspected, MA-235B-1F-39 is equivalent to LA 16634, then pooling of the very large site LA 16632, site LA 54369, isolate MA-235B-1F-39, and the small site LA 16634 may prove to be justified. If so, then the overall depositional and chronometric potential of LA 16632 is extended by the addition of Chupadero Black-on-white to its inventory and by the discovery of artifacts and hearth remains on the northern and eastern ridge slope where aeolian deposition may be expected to have kept pace with erosion. It is likely that substantial deposits are present in these areas, given the depositional regime and the quantity of materials observed. The site may be as much as 90% intact.

5.2.14 Site: MA-235B-14, LA 54370

Location: T22S, R31E, S34, SE 1/4

Previous Study: None

This site consists of only three artifacts and one fragment of burned caliche, located in two adjacent blowouts.

No site subareas were noted.

A possible feature was indicated by an ephemeral ash stain located in a blowout wall 4.5 m northeast of datum.

The observed lithic assemblage included one flake, a core and a metate. The core flake had no cortex on its dorsal surface nor any edge modification. Due to incompleteness, thickness could not be ascertained. The flake was manufactured from a silicified sandstone. The chert core had a single platform from which flakes were removed unidirectionally. The core was utilized, as determined by edge battering evidence. The groundstone sample consisted of a single metate fragment.

No ceramics were noted.

Neither bone nor shell was noted on this site.

Depositional potential on this sparse site is probably limited to dune pediments within and to the north and east of the site boundaries. Site deposits may be greater than or equal to 50% intact.

5.2.15 Site: MA-235B-15; LA 54371

Location: T22S, R31E, S34, SE 1/4

Previous Study: None

This site consists of a groundstone and burned caliche scatter in a single blowout.

No subareas were isolated.

Features consist of a metate and two mano fragments, indicating a milling area, together with scattered burned caliche, indicating a deflated hearth.

The lithic assemblage from this site was the only one in the project that produced no chipped stone artifacts. Only two groundstones were recorded. The mano and metate were both manufactured from a fine-grained sandstone. The mano was circular in plan view (one-hand mano). The metate was complete; the worked surface was basin shaped.

No ceramics were noted on this site.

Neither bone nor shell was noted on this site.

Deposits may remain intact in low dunes to either side of the blowout containing this site. Insufficient data are present to assess site intactness.

5.2.16 Site: MA 235B-16; LA 54372

Location: T22S, R31E, S35, SW 1/4

Previous Study: None

This site consists of a burned caliche, burned sandstone, and lithic scatter in two adjacent blowouts on a ridge to the north of a playa.

No subareas were noted.

A cluster of burned rock which includes a hammerstone may represent a partly deflated hearth.

The lithic sample included two debitage pieces and a hammerstone. Of the debitage, one piece was a core flake and the other a biface flake. Neither cortex nor edge damage was present on either flake. Thickness ranged from 6 mm to 8 mm. Chert (50%) and chalcedony (50%) constituted the debitage material types. A silicified sandstone hammerstone evidenced battering along one margin. This is one of ten sites in the project area that yielded no groundstone implements.

No ceramics were noted on this site.

Neither bone nor shell was encountered on this site.

Numerous cultural items were noted in locations well up the lateral slopes of blowouts, suggesting that shallow deposition is present in this site. Perhaps 50% of the site remains intact.

5.2.17 Site: MA-235B-17, LA 54376

Location: T22S, R31E, S35, SW 1/4

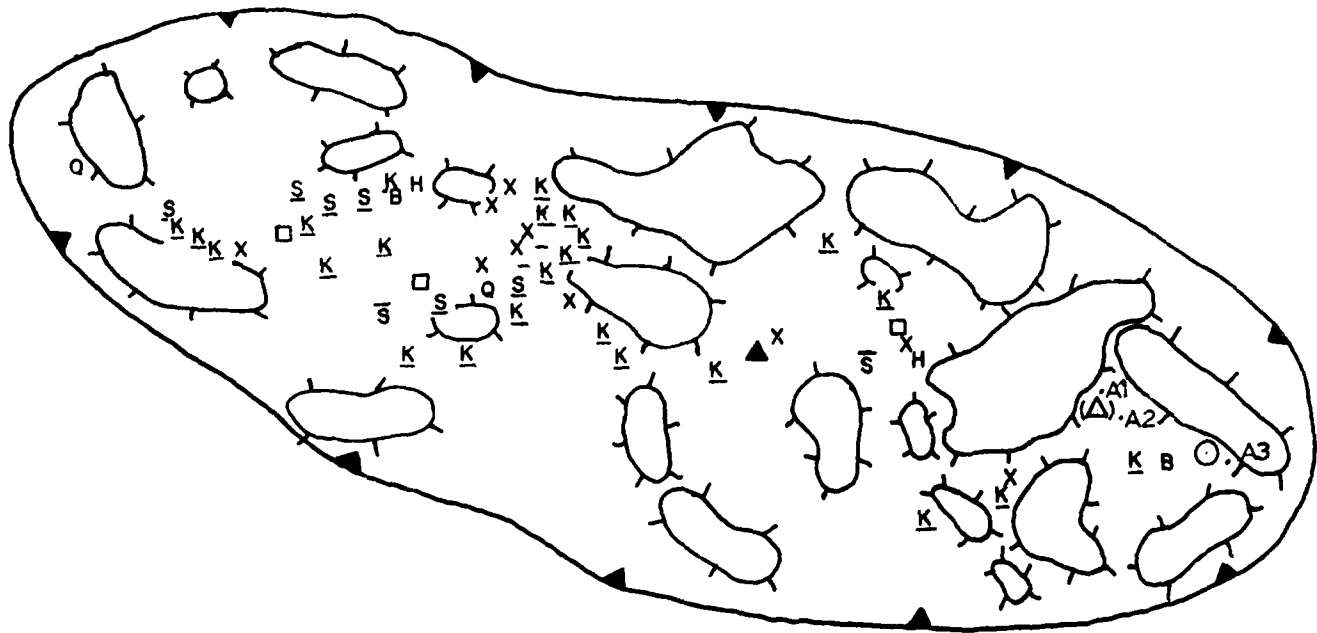
Previous Study: None

This site consists of fire-cracked rock and chipped stone scatters, several pieces of groundstone, and several sherds located in an interconnected series of blowouts at the northeast edge of a playa. The hearths suggest food processing activities in addition to lithic reduction.

No clear subareas were evident. Both burned rock and artifacts occurred in higher frequencies in the western half of the site than in the eastern half (Figure 5.8).

Features consist of perhaps five to seven hearths, represented by scatters of burned caliche and sandstone and, in the southeast corner, a concentration of fire-cracked rock with an ash stain. Feature remnants on the stabilized faces of the dunes may be intact while those in the center of blowouts may have experienced erosion. The southeast hearth appears intact.

The lithic assemblage consisted of 16 debitage items, 1 projectile point, 2 hammerstones, and 5 groundstones. The chipped stone represented indicates both biface reduction and primary and secondary stages of core reduction. Ten core flakes constituted 63% of the debitage inventory. In addition, three biface flakes, one unknown flake, and two angular debris fragments were recorded. No cortex was present on 86% of the flakes. None of the debitage exhibited edge modification. Thickness was less than 3 mm for 57% of the measurable specimens. Other flake thicknesses varied up to 12 mm. The debitage material range included cherts (44%), chalcedony (31%), caliche (19%), and silicified sandstone (6%).



MA235B-17
LA54373

0 10M

Figure 5.8 MA235B-17/LA 54373, WIPP Assessment Study, ACOE, 1986.

Tools included a complete Marshall (Late Archaic) projectile point, which was collected (see Lithic Appendix, artifact number 7). The silicified sandstone hammerstone was battered along the margins. All five pieces of groundstone were sandstone manos. Use wear and shape varied. At least one specimen was wedge shaped, indicating extensive use. Two were circular in plan view (one-hand manos).

The site produced four sherds, one from a Jornada Plain Brown jar and three from El Paso Brown jars. The types date the occupation to the A.D. 200-1350 period, covering the Hueco to Maljamar phases.

A bone fragment was found in the southeast portion of the site near the intact hearth. No shell was found.

Blowouts are more extensive in the western half of the site, leaving more artifacts exposed than in the eastern half. Stabilization of dune faces by a dark gray paleosol at 1.5-2 m below dune crests as well as the intact hearth and the burned caliche appearing in a badger burrow, both at the southeast edge of the site, suggest that considerable site integrity remains. Perhaps 30% of the site has been eroded by aeolian action. Another observed impact was grazing. Cultural deposition is probably greatest in the eastern half of the site, where more intact dune pediments are present.

The intact hearth and probable subsurface hearths (suggested by the burrow spoil) indicate the site's chronometric potential. The presence of apparently intact features at the surface and below confirm the site's potential for informing on Late Archaic and Mogollon activities. Perhaps 30% of the site remains intact.

5.2.18 Site: MA-235B-18; LA 54374

Location: T22S, R31E, S35, SW 1/4

Previous Study: None

This site consists of fire-cracked rock and ceramic and lithic scatters, along with several pieces of groundstone, located in a long northeast-southwest trending blowout, the southwest end of which is demarcated by a dune spur perpendicular to the long axis of the blowout (Figure 5.9). The site is situated on a low rise north of a playa. A Scallorn corner-notched point and ceramics indicate the camp was occupied sometime in the Early Ceramic (AD 200-700) period. The burned rock and the groundstone (two small, easily portable and possibly hand-held metates and two one-hand manos) suggest food processing activities occurred.

Although the perpendicular dune spur divides the site into two different sections, it is likely that the spur represents recent activity, as it is not stabilized by mesquite.

Burned caliche and burned sandstone indicate the remains of one or two hearths. The burned rock primarily occurs below the gray to brown paleosol where it is exposed on pediments but above this stratum where it occurs in the bottom of blowouts, suggesting that the hearths were originally placed on a

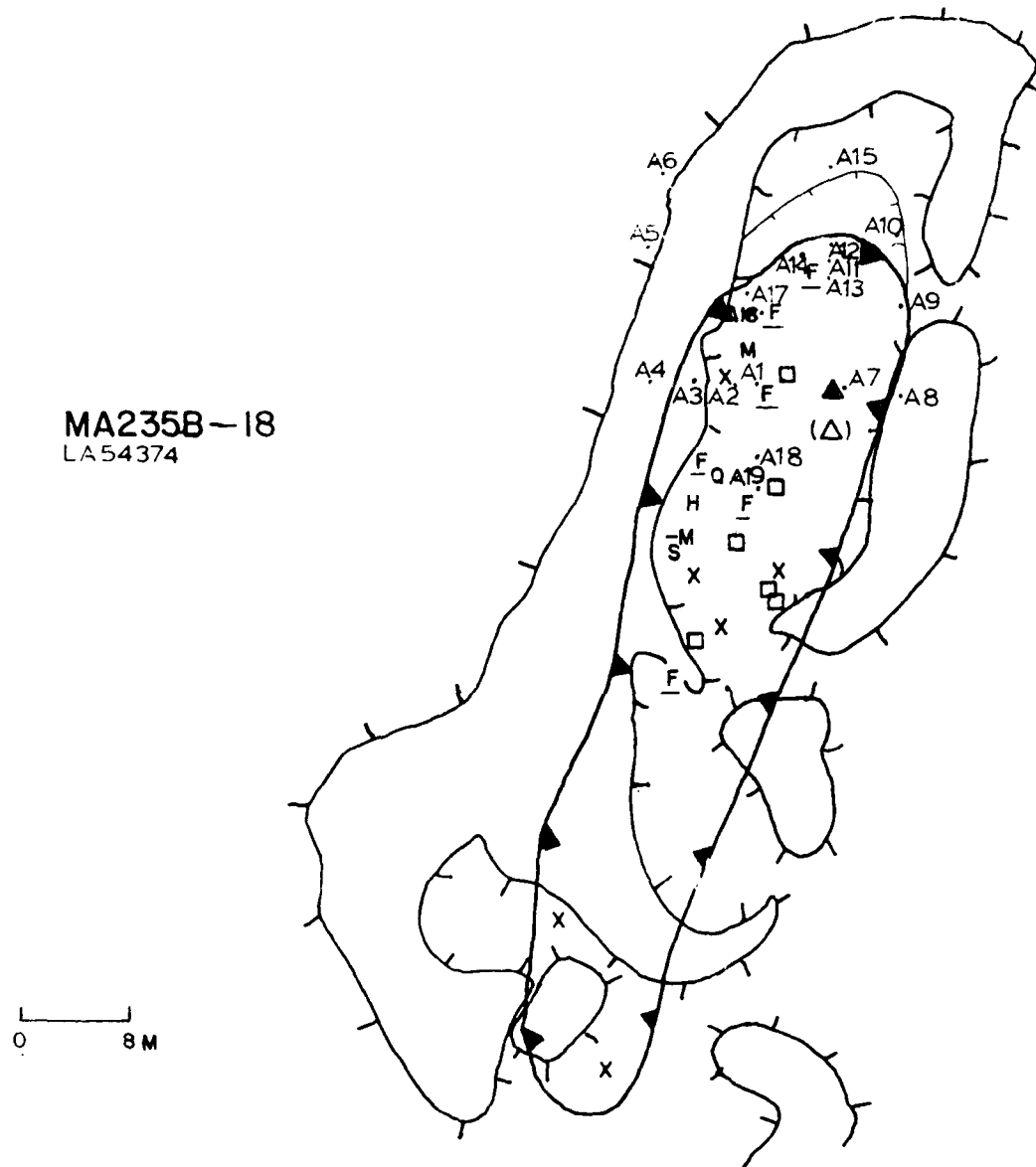


Figure 5.9 MA235-18/LA 54374, WIPP Assessment Study, ACOE, 1986.

later stratum and are eroding down to the paleosol. Some hearths may be in original depositional contact.

The lithic assemblage yielded four debitage fragments, one projectile point, a scraper, a hammerstone, and five groundstones. Angular debris accounted for all the recorded debitage. Edge damage was not found on any of the specimens. Thickness could not be evaluated due to incompleteness. Debitage material types included chalcedony (50%), silicified sandstone (25%), and limestone (25%).

Tools included a chert Scallorn projectile point midsection which was collected (see Lithic Appendix, artifact number 8). The chert scraper was step fractured along two margins. It evidenced unidirectional retouch. A silicified sandstone cobble hammerstone was battered on the margins.

The groundstone sample included two manos, two metates and an unknown fragment (see Appendix C-6). All were produced from fine grained silicified sandstones. Use wear and shape varied. One mano was bifacially ground and the other unifacially ground. Both metates were small, possibly hand-held and featured unifacially ground platforms with concave surfaces.

This site contained four sherds, all from one or more El Paso Brown jars. These date the occupation to the A.D. 200-1350 period, covering the Hueco to Maljamar phases.

Neither bone nor shell was found on this site.

This site has been lightly to moderately affected by aeolian action; it has also been grazed. As with the fire-cracked rock, most artifacts occurred below the paleosol exposed on pediment faces but above the paleosol exposures in the blowout bottoms, indicating their origin in a more recent stratum. Perhaps 50% of the site has been affected by erosion. Intact artifacts and features may be present in the less eroded north, east, and south edges of the blowout.

5.2.19 Site: MA-235B-19; LA 54375

Location: T22S, R31E, S35, SW 1/4

Previous Study: None

This site consists of an extensive scatter of fire-cracked rock with additional lithic scatters, groundstone, and ceramics (Figure 5.10). The site is situated on a large low rise south of a playa. Brownware sherds suggest that the occupation is Mogollon, possibly dating to the late period. The many hearths and groundstone reflect food preparation, and the lithic debitage and hammerstone indicate lithic reduction activities.

Site structure is difficult to determine because the site, although exposed in many blowouts, is probably partially obscured by sand; moreover, cultural debris in the northernmost blowout may have washed downslope from the low rise on which most of the site occurs. Based on available evidence, some generalizations can be made. Five blowouts, primarily located on the

MA235B-19
LA54375

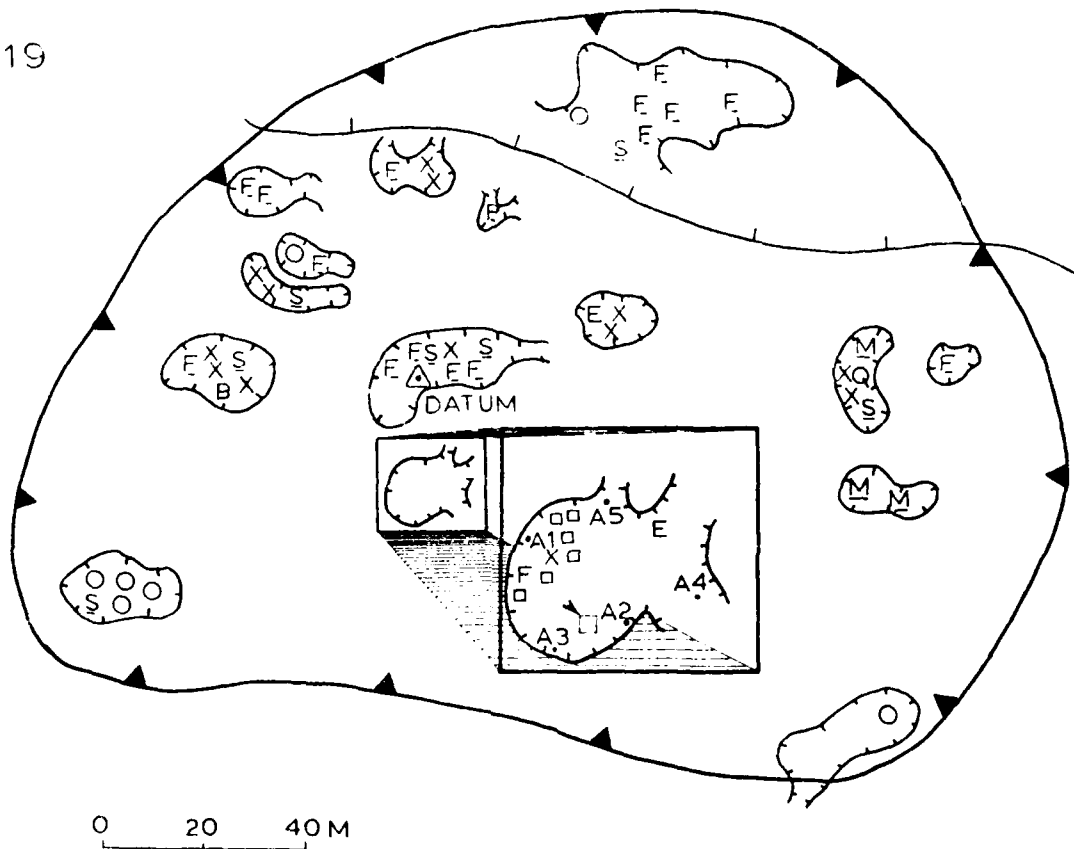


Figure 5.10 MA235B-19/LA 54375, WIPP Assessment Study, ACOE, 1986.

periphery of the site, show evidence of food preparation only, in the form of ash stains and fire-cracked rock. Groundstone, also associated with food processing, is present only on the eastern half of the site, in two blowouts 10 m apart. Only one blowout contains ceramics; these are associated with fire-cracked rock and one piece of chipped stone. In one blowout, two pieces of chipped stone co-occur with a hammerstone and an obsidian scraper; no other artifact types were visible. Elsewhere, chipped stone co-occurs with fire-cracked rock and groundstone. The seven intact ash stains occur in four different blowouts. Suggestions are that parts of the site may have been used differently, but little more can be said on the basis of surface evidence.

At least seven intact ash stains are present and suggest an absence of deflation in these areas. Other hearths, represented by fire-cracked caliche and some burned sandstone, may total nine or more. Only two of the 15 blowouts do not contain ash or fire-cracked rock. Most of the firecracked rock occurs in the bottom of blowouts and appears to be eroding on to the medium brown paleosol. One piece of fire-cracked rock occurs at about 1.5 m below a dune crest on the south face of a blowout, possibly indicating its original stratigraphic position. The fire-cracked rock scatter along the base of the slope has a limited extent and may have washed downslope from the rise; the presence of an ash stain in this area, however, suggests that this low locus may have experienced only aeolian erosion. The ash stains suggest that many of these features are not eroded.

Debitage accounted for 36 pieces (86%) of the recorded lithic artifacts. In addition, one scraper, a core, a hammerstone, and three groundstone were inventoried. The debitage assemblage included 17 (47%) core flakes, 11 biface flakes (31%), and 8 (22%) angular debris fragments. No cortex was present on 93% of the flakes. No edge damage was evident on 97% of the debitage. One specimen was unidirectionally retouched. Thickness varied and ranged up to 7 mm, while 67% of the measurements were less than 3 mm. The debitage material types included cherts (53%), chalcedony (33%), silicified wood (8%), silicified sandstone (3%) and siltstone (3%). The chert core is a tested cobble with two cortical platforms. It retained 80% cortex and did not evidence utilization.

Tools included an obsidian scraper which was collected (see Lithic Appendix, artifact number 9). A caliche hammerstone was battered along the margins. Two metate fragments and one mano fragment constituted the groundstone sample. All were manufactured from sandstone. Both metates were unifacially ground. One had a basin use surface; the other was a small hand held grinding platform or palette. The mano was wedge-shaped, indicating extensive use wear.

The site contained nine sherds. Two sherds were from El Paso Brown bowls and two from El Paso Brown jars, with three Jornada Brown jar and two El Paso painted sherds. These types date the site to the A.D. 200-1350 period, covering the Hueco to Maljamar phases.

Several pieces of mineralized bone are present in a blowout on the western edge of the site. No shell was found.

While deflation and grazing have obviously occurred at the site and perhaps slopewash erosion as well, the ash stains suggest that perhaps 70% of the site is intact. The site has potential for chronometric dating and intact deposits from the Mogollon period. Cultural deposition is likely between areas of materials currently exposed in blowouts.

5.2.20 Site: MA235B-20; LA 54376

Location: T22S, R31E, S33, SE 1/4

Previous Study: None

This site consists of lithic and groundstone scatters with burned caliche and two sherds. The site consists of cultural materials in five unconnected blowouts located on a low rise with western and southern exposures. The presence of ceramics suggests the occupation dates to sometime in the Mogollon period (post AD 500). Hearths and groundstone reflect food processing activities during the encampment.

Locus A contains four manos, as well as fire-cracked rock and a sherd. Locus B, 55 m northwest of Locus A, contains chipped stone and fire-cracked rock. Three blowouts north of Locus B contain a few artifacts. Locus B appears to be a lithic reduction area and Locus A a food grinding area; both are associated with hearths.

Locus B contains an intact hearth on paleosol. Two of the blowouts north of Locus B contain one piece of fire-cracked rock each. Locus A has several pieces of fire-cracked rock. Total hearth count is at least four.

Locus A contains no evidence of paleosol; artifacts may be eroding or relatively intact. A paleosol in Locus B is present at the bottom of blowouts and along the south face of the pediment. An apparently intact hearth occurs directly on this surface. The northern blowout containing fire-cracked rock and a sherd has no visible paleosols; artifacts occur at 1 to 1.5 m below the low dune crest. The northern blowout with burned rock and a mano contains a brown paleosol, but artifacts occur in sand above it.

Hearths at this site occur both on paleosol and in sand above it. If the features are contemporaneous, then the paleosol contact hearth must have eroded to its present level.

The inventoried lithic assemblage included five pieces of debitage and five groundstones. The debitage sample consisted of three core flakes and two biface flakes. No cortex was present on 80% of the flakes. None were retouched or utilized. Thickness varied from 1 mm to 4 mm on those flakes which were measurable. Material types included quartzite (60%), chalcedony (20%) and chert (20%). Five manos constituted the groundstone sample (see Appendix C-6). Four were manufactured from sandstone and one from caliche. All were unifacially ground, indicating preferential or nominal use.

This site contained two sherds, one Jornada Brown jar and one indeterminate brown jar. These types date the site somewhere in the A.D. 200-1350 range, covering the Hueco to Maljamar phases.

No bone or shell was found at this site.

Artifacts occur above paleosol in one blowout; on paleosol in Locus B; and in sand in Locus A and another blowout, neither of which contains any visible paleosol. If the blowout materials are contemporaneous, then those in Locus B have been eroded; otherwise, the items in Locus B must be older than those elsewhere on the site. The site's chronometric potential is most promising in the dunes north of Locus B and south of the three northernmost blowouts. Integrity of deposits is potentially high but difficult to assess on the basis of insufficient data.

5.2.21 Site: MA235B-21; LA 54377

Location: T22S, R31E, S33, SE 1/4

Previous Study: None

This site consists of a scatter of fire-cracked rock and chipped stone, along with several pieces of groundstone, in four unconnected blowouts trending north-south. The blowouts are situated on a low rise with southwestern exposure. The presence of one brownware sherd and the lack of additional time diagnostic artifacts may indicate a ceramic period occupation. The groundstone, fire-cracked rock, and ash stain reflect food preparation behavior, and the chipped stone reflects lithic reduction activities.

The two central blowouts contain only burned rock and chipped stone. Groundstone is present in the eastern and westernmost blowouts, making it possible that grinding did not take place in the two central blowouts.

The burned caliche and burned sandstone indicate at least three hearths were present, each in a different blowout. Most artifacts in the westernmost blowout occur on the paleosol that is exposed at the bottom and along pediment faces. The cultural materials may have experienced erosion, and an ash stain at approximately 1.5 m below the dune crest in this westernmost blowout may indicate the original surface on which artifacts were deposited. This ash stain represents an intact hearth. The easternmost blowout is the only one with no hearth visible.

The lithic assemblage included seven debitage artifacts and three groundstones. The debitage sample was comprised of two pieces of angular debris and five core flakes. Sixty percent of the flakes had no cortex. The remaining flakes ranged from 10% to 40% in dorsal surface cortex presence. No edge modification was evident on 86% of the debitage. One flake exhibited step fracturing along one margin and may have had a secondary use as a spokeshave. Those debitage artifacts measurable for thickness varied from 4 mm to 12 mm. Material types included cherts (71%), silicified sandstone (14%) and silicified wood (14%).

One mano, a metate and a pestle were itemized in the groundstone sample. All were manufactured from sandstone. The mano's cross section was wedge-shaped and the surfaces were bifacially ground, connoting extensive use

wear. The metate was unifacially utilized for grinding. The use surface was concave. The pestle was worn bifacially.

The site contained one El Paso painted ware jar sherd. The occupation could date to the A.D. 1100-1350 period, which would encompass the Querecho and Maljamar phases.

No bone or shell was found on this site.

The site has experienced moderate erosion and grazing but is probably 60% intact. The westernmost blowout has probably experienced extensive erosion as most artifacts are deposited on paleosol, but an ash stain indicates that some deposits may remain intact on the edges of this blowout. Other materials may be present between the four blowouts.

5.2.22 Site: MA235B-22; LA 54378

Location: T23S, R31E, S4, SE 1/4

Previous Study: None

This site comprises a scatter of chipped stone and fire-cracked rock distributed among three unconnected blowouts. The site is situated on a low mobile dune ridge. The lack of time diagnostic artifacts makes it impossible to determine the culture and date represented, based on surface evidence. Activities involved were food processing, based on the fire-cracked rock.

The tabulated lithic assemblage comprised 100% debitage. This is one of three sites that contained neither chipped stone tools nor groundstone artifacts. Four flakes and three angular debris fragments comprised the debitage sample. Of the flakes, three were evaluated as core flakes and one as a blade flake. No cortex was present on any of the flakes. None of the debitage exhibited retouch or utilization. Those flakes measurable for thickness were 4 mm and 5 mm in dimension. Material types included cherts (57%), chalcedony (29%) and silicified wood (14%). This is one of ten sites in the project area that produced no groundstone specimens.

No evidence suggesting site structure or subareas is present.

Burned caliche in each of the three blowouts indicated a minimum of three hearths was present. Fire-cracked rock occurs in the bottom of each blowout and in the largest blowout at 1.5 m and 2.5 m below the crest of the highest dune at the north edge of the main blowout; these high locations may indicate original stratigraphic position. A concentration of burned rock in the southeast portion of the medium sized blowout may represent an articulated hearth.

No bone or shell was located on this site.

The site is lightly eroded with presently active sand aeolian deposition. Site area has been grazed and disturbed by aeolian activity. It is perhaps 50% intact. The site has been grazed lightly. Although few artifacts are presently visible, the site is undergoing aeolian deposition and many more

artifacts may be present in blowouts and in the areas between them. No evidence of paleosols was visible.

5.2.23 Site: MA235B-23; LA 54379

Location: T23S, R31E, S4, SE 1/4
Previous Study: None

This site consists of a scatter of fire-cracked rock, one chipped stone piece and one piece of groundstone in three partially connected blowouts. The blowouts are located on a low ridge trending east-southeast by west-northwest. The lack of time diagnostic artifacts makes the occupation's time period and culture difficult to determine on the basis of materials exposed at the surface. The hearths, groundstone and lithics indicate food preparation and overlook activities.

Possibly three hearths are present in the two connected blowouts. Too few artifacts are present to distinguish subareas or site structure.

A minimum of four hearths may be present, based on concentrations of fire-cracked rock. Three of these occur in the connected blowouts; the one at the west end appears to be intact and lies on the bottom of the blowout, as do most other cultural materials.

The small lithic sample consisted of one flake and one groundstone. The biface flake had no cortex. No edge modification or thickness was present. The material type was a silicified sandstone. The single groundstone was a sandstone mano. It was unifacially ground and convex in cross-section, suggesting nominal use wear.

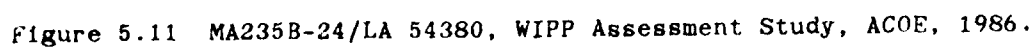
No bone or shell was located on this site.

All but three artifacts occur in the connected blowouts. The site has been grazed and possibly eroded but is currently undergoing active aeolian deposition. No paleosols are present. Most of the site assemblage is probably concealed. Two artifacts occurring 1 m below the low crest along the north edge of the main blowout may suggest their original stratigraphic position. The site is judged 50% intact and offers good potential for future research.

5.2.24 Site: MA235B-24; LA 54380

Location: T22S, R31E, S33, SE 1/4
Previous Study: None

This site comprises a lithic scatter with fire-cracked rock and several pieces of groundstone. The site is located on a low ridge trending east-northeast by west-southwest with southern exposure. Only two of the four partially connected blowouts contain substantial numbers of artifacts (Figure 5.11). The Middle Archaic point in the southeast blowout suggests that this encampment dates to 3000-5000 BP. The high proportion of lithics indicates a



hunting camp, with the tools, scraper, and spokeshave suggesting rehafting activities. The burned rock reflects food preparation.

The number of artifacts is too small to allow a discussion of site structure or subareas. All but one of the blowouts contain chipped stone tools, and each blowout has at least one piece of fire-cracked rock; this may indicate similar use of each of the blowouts.

The best evidence for a possibly intact hearth is in the central blowout. Each of the other three blowouts contains only one piece of burned caliche or burned sandstone. The central blowout contains a medium brown paleosol and desert pavement of pebbles on which most artifacts rest. The burned and possibly ground sandstone lies approximately 1 m above the bottom of the blowout along the connecting ridge with the main blowout and may represent the hearth's initial stratigraphic position. Some of the features may be intact.

The tabulated lithic assemblage included four debitage pieces, two projectile points, one scraper, one denticulate and two groundstones. The debitage sample consisted of one core flake and three biface flakes. No cortex was present on 75% of the flakes. Ten percent cortex was present on one flake. No edge modification was recorded for any of the flakes. Thicknesses that were measurable ranged from 4 mm to 5 mm in dimension. Debitage material types included cherts (50%) and silicified sandstones (50%).

Tools included a chert projectile point base, which was collected. Its morphology is suggestive of a late Archaic Travis dart point (see Lithic Appendix, artifact number 11). A chalcedony projectile point tip was noted. The flaking technology was rudimentary and the artifact was perhaps incomplete. A complete chert scraper with a steep working edge angle was recorded. The recorded chert spokeshave had stacked step fractures along two concave margins. Ten percent of the surface cortex was present. The groundstone sample included a mano and an unidentifiable fragment. Both were manufactured from sandstone. The mano was unifacially ground and the surface planoid. The fragment's surface was eroded.

Neither bone nor shell was located in this site.

The site has been grazed and moderately eroded but is approximately 75% intact. Paleosol is exposed in the two blowouts with many artifacts. Artifacts in the southeast blowout are situated on the bottom and up to 1/2 m upslope. The central blowout may contain other artifacts along the ridge connecting this blowout with the southeast blowout, in the area where the possible groundstone was found. The possibility for other artifacts in the dunes between the blowouts is very good and chronometric potential is high.

5.2.25 Site: MA235B-25; LA 54381

Location: T23S, R31E, S4, NE 1/4
Previous Study: None

This site consists of fire-cracked rock scatters, lithics, and groundstone in five different locations in one continuous arc-shaped blowout.

The blowout is situated on an extensive low rise with southern exposure. The absence of ceramics and the presence of a Middle or Late Archaic point suggests occupation of the camp between 5000 to 1500 BP. The moderate frequency of lithics includes a reworked point and three cores that appear to have been used for pounding and chopping. The abundant fire-cracked rock, the charcoal stain, and the groundstone reflect food preparation. The reworked point and hammerstones indicate hunting and armament activities.

Five or more hearths represented by fire-cracked rock and charcoal have groundstone and lithics distributed around them. The artifacts are too few to delineate further patterns.

Two concentrations of fire-cracked rock and one charcoal stain may represent intact hearths. Two scatters of fire-cracked rock may represent additional hearths that have experienced erosion.

This site features a high proportion of cores with composite tool use. The lithic assemblage included one debitage piece, a projectile point, three cores, and three groundstone implements. The debitage consisted of a single chalcedony core flake.

A chert, Ellis-like projectile point (Artifact 11, Appendix B) was collected. It was extensively reworked.

Three multifaceted nonexhausted cores were recorded. Two were produced from cherts and one from a silicified sandstone. All have utilization consisting of battering. The margins have stacked step fractures. One of the cores is edge ground. The groundstone sample included two metate fragments and a mano. One metate fragment has been reworked into a small hand held metate. The mano is wedge shaped. The debitage sample (13%) is proportionally small compared to the tool and groundstone frequency.

The site has experienced light to moderate erosion and grazing. Paleosol and a desert pavement of pebbles are present in each location; artifacts rest on this surface. Artifact visibility is good. Deposition is likely in dune pediments and in portions of blowout floors. The site is estimated to be approximately 50% intact.

5.2.26 Site: MA235B-26; LA 54382

Location: T22S, R31E, S33, SE 1/4

Previous Study: None

The site consists of a scatter of fire-cracked rock and one flake in a large blowout with southern exposure. The blowout is situated on a low dune ridge trending east-southeast by west-northwest. The lack of time diagnostic artifacts makes the time and culture of occupation impossible to determine on the basis of surface exposures. The fire-cracked rock indicates food preparation activities at the site.

No site structure or subareas can be delineated at this time.

The burned caliche and sandstone may represent the remains of two to three hearths. A medium brown paleosol is present on the south face of the south dune pediment. The linear fire-cracked rock scatter occurs just below the lower visible edge of this surface and may represent an intact hearth eroding from the paleosol.

The small lithic assemblage yielded a single biface flake. No cortex was present in the dorsal surface. The margins have no indication of edge modification. Thickness was 2 mm and material type was chert. This is one of ten sites in the project area that yielded no groundstone implements.

Neither bone nor shell was present on the surface of this site.

The site has undergone light erosion and grazing. Artifact visibility is low due to current aeolian sand deposition. Deposition is likely on the edge of the blowout and in pediments. Site integrity is impossible to assess without testing.

5.2.27 Site: MA235B-27; LA 54383

Location: T22S, R31E, S33, SE 1/4

Previous Study: None

This site consists of materials in four unconnected blowouts some 20 m apart. The artifacts are fire-cracked rock, groundstone, and chipped stone. The blowouts are located on a low dune ridge trending east-northeast by west-southwest. The lack of time diagnostic artifacts makes the culture and period of occupation impossible to determine on the basis of surface evidence. The fire-cracked rock and groundstone reflect food preparation activities at the camp. Additional activities included lithic reduction.

The northwest and southwest blowouts areas are different in terms of surface materials. The chipped stone is confined to the southeast blowouts, and all but two of the pieces of fire-cracked rock are in the northwest blowouts. The differences may reflect different use of the two areas or different artifact visibility.

The southeasternmost blowout contains the remains of at least one hearth. The northwestern blowout area contains two to three hearths, one or two of which may be intact. Paleosol is visible on the west face of the west dune pediment in the southeast blowout. Artifacts occur below this level in the bottom of the blowout. The eastern blowout of the northwest area contains caliche in the blowout bottom as well as 1/2 m up the slopes. The higher locations may represent an intact hearth.

The recorded lithic assemblage included six debitage artifacts and two groundstones. The debitage consisted of three core flakes, two biface flakes, and one angular debris fragment. Cortex was not present on any of the debitage. One flake had both dorsal surface and marginal retouch. For those flakes that were measurable, thickness ranged from 2 mm to 9 mm. The utilized material was 100% chert.

The groundstone sample consisted of a mano and a metate. Both were manufactured from sandstone. The mano was bifacially ground and circular in plan view (one-hand mano). The metate was unifacially ground and displayed a ground basin on the worked surface.

No bone or shell was visible on the surface of this site.

The site has experienced grazing and light to moderate erosion. The active sand in the bottom of the southeasternmost blowout contains artifacts and may overlie the paleosol level that is exposed on the pediment faces. Artifact visibility in this blowout is low. Artifacts in the western blowout of the southeast area lie on a desert pavement with pebbles and on a medium brown paleosol. This blowout is more depositionally stable than the former. Additional deposition is probably present in the bottoms of active blowouts (all except the western one in the southeast area) and along blowout edges. Overall site integrity is impossible to assess without testing.

5.2.28 Site: MA235B-28; LA 54384

Location: T22S, R31E, S19, NW 1/4

Previous Study: None

This site comprises a sparse scatter of chipped stone and one piece each of burned caliche and possibly ground sandstone. The materials are located in a blowout on a low rise with southern exposure. The lack of time diagnostic artifacts makes the culture and period of occupation difficult to determine. Activities at the camp included lithic reduction (the point midsection with a bend break was probably broken in manufacture) and food preparation.

The site contains too few materials to delineate site structure or subareas.

A piece of burned caliche suggests the presence of a hearth.

The itemized lithic assemblage yielded one flake, a projectile point, a hammerstone, and a groundstone. The chert core flake had no cortex present on its dorsal surface nor any evidence of edge modification. A thickness value was not obtainable. A chert projectile point midsection was recorded. The snap on the tapered end was a bend break and suggested breakage during manufacture. The hammerstone was a conglomerate cobble with battering evidence on one end. The sandstone mano was unifacially ground. The use surface was planoid in cross section.

No bone or shell was visible on the surface of this site.

The site has been grazed and lightly eroded. The blowout area is stabilized by vegetation and many more artifacts may be present. Visible artifacts are located in the bottom of the blowout and about 1/2 m up the gradual slope. Artifact visibility is somewhat obscured by vegetation. Deposition in dune pediments is likely. Site integrity is impossible to assess without testing.

5.2.29 Site: MA235B-29; LA 54385

Location: T22S, R31E, S19, NW 1/4

Previous Study: None

This site consists of fire-cracked rock and lithic scatters in a long series of connected blowouts (with one exception) with low relief (Figure 5.12). The blowouts are probably also experiencing water flow from small washes. The blowouts are situated on a low rise with southern exposure. The extent of paleosol on top of dune pediments above the level of artifacts; the unusually high proportion of complete flakes that are short, wide, and thick; and the total absence of groundstone suggest that this site is PaleoIndian in age. Lithic manufacture and food preparation are some of the activities evident at the site.

No site structure or subareas are discernible in this fairly homogenous assemblage. Spatially discrete areas are in the central blowout, the south end, and two loci at the north end.

Two soil stains and one fire-cracked rock concentration probably represent three intact hearths. At least four other hearths, represented by clusters of fire-cracked rock (caliche and sandstone) may be present. Most artifacts are on or in the reddish brown paleosol and appear to be in original stratigraphic position.

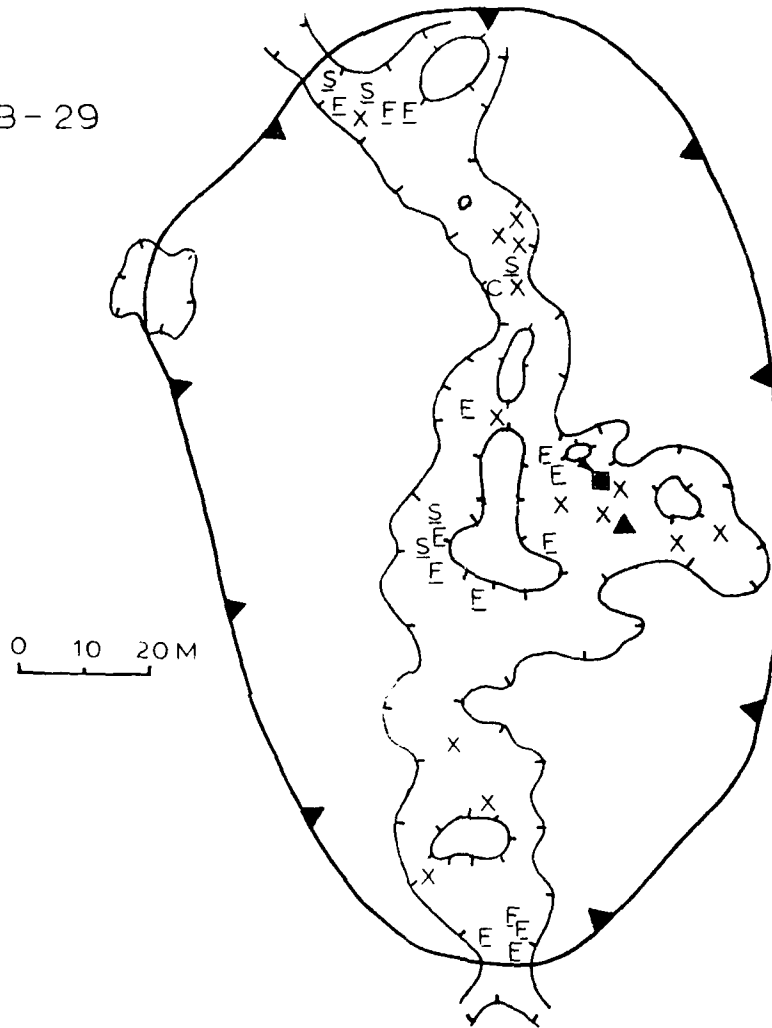
The lithic assemblage included 15 debitage pieces and 1 core. The debitage sample consisted of nine (60%) core flakes, two biface flakes and three angular debris fragments. Of the flakes, eleven (92%) had no cortex present on the dorsal surface. One specimen had 65% cortex. None of the debitage exhibited any edge modification. Sixty four percent of the measurable thicknesses were greater than 7 mm. Other values ranged evenly from 2 mm to 5 mm. Debitage material types included cherts (33%), silicified sandstone (33%), chalcedony (27%) and jasper (7%).

The recorded chert core was produced by a unidirectional flake removal technology. It was not exhausted. An unusually high proportion of complete flakes and the absence of groundstone characterize this assemblage.

No bone or shell was visible on the surface of this site.

The site has been grazed and subjected to light erosion by wind and small washes. The site is judged to be 30% intact. The paleosol is exposed along the low dune slopes and in the bottoms of blowouts. Much vegetation has stabilized the site surface and has limited aeolian action somewhat. Good potential for intact deposits is present in dune pediments.

MA235B-29
LA54385



| KEY | | |
|-----------------|-------------|-------------------|
| B BONE OR TOOTH | M METATE | ○ FINE OF BLOWOUT |
| C CORE | P PESTLE | △ SITE BOUNDARY |
| D SHELL | G MAND | □ DOWNSTREAM |
| E SCRAPER | S SANDSTONE | □ GRASS |
| F ROCK | V DIFACE | □ HOLLOW |
| H HAMMERSTONE | X LITHIC | □ HOLLOW |
| A ALLOYE | Z POINT | □ HOLLOW |
| D ASH STAIN | E3 OF NAME | □ HOLLOW |
| B BATH | □ HOLLOW | □ HOLLOW |
| L LITHIC | □ HOLLOW | □ HOLLOW |

Figure 5.12 MA235B-29/LA 54385, WIPP Assessment Study, ACOE, 1986.

5.2.30 Site: MA235B-30; LA 54386

Location: T23S, R31E, S4, SE 1/4

Previous Study: None

This site consists of an ash stain with associated lithic scatter and one piece of groundstone. Materials were discovered in one blowout located on a dune ridge trending east-northeast by west-southwest. The absence of time diagnostic artifacts makes the determination of time period and culture difficult. A possible mano and an ash stain reflect food processing, and the debitage indicates core reduction.

The cultural materials are too few to allow delineation of site structure or subareas.

No fire-cracked rock is present, but an ash stain represents the remains of one hearth, probably intact.

The lithic assemblage yielded four debitage artifacts and one groundstone fragment. Four core flakes constituted the debitage sample. No cortex was present on two (50%) specimens; two had 10% cortex on the dorsal surface. No retouch or utilization was evident on any of the debitage. Only one specimen was measurable for thickness, and produced a value of 7 mm. The debitage material types included cherts (50%), chalcedony (25%), and jasper (25%). The groundstone sample consisted of a single sandstone mano. While the stone appeared shaped, the surfaces were highly eroded and grinding attributes were not evident.

No bone or shell was visible at the site's surface.

The site has been grazed and lightly to moderately eroded. A medium brown paleosol is exposed in portions of the bottom of the blowout and on pediment faces. Artifacts rest near this surface and may have been deposited on it or eroded down to it. Moderate potential for cultural deposition lies in the bottom of blowouts and in pediment faces. Site integrity is impossible to assess on the basis of insufficient evidence.

5.2.31 Site: MA235B-31; LA 54387

Location: T22S, R31E, S33, SE 1/4

Previous Study: None

This site consists of a lithic scatter with two pieces of groundstone and one piece of burned caliche. The materials are located in two connected blowouts situated on a ridge trending north-northeast by south-southwest with southern exposure. A Late Archaic/Early Ceramic point suggests that occupation dates to approximately 2000 BP. Lithic manufacture is represented by core flakes and a rough-out point. The mano and metate and the burned caliche reflect food preparation activities.

Too few artifacts are present in the blowout to distinguish site structure or subareas.

One piece of burned caliche occurs 1/2 m above the bottom of the blowout and may represent the original stratigraphic position of artifacts.

The observed lithic assemblage yielded four debitage artifacts, two projectile points and two groundstones. The debitage sample included two core flakes, an unknown fragment, and one angular debris fragment. No cortex or edge modification was present on any of the flakes. Thickness was obtainable from only one flake, with a value of 13 mm. Debitage material types utilized were quartzite (50%), chert (25%) and chalcedony (25%).

A late Archaic, Marshall type, quartzite projectile point was collected. A siltstone denticulate was also collected (see Lithic Appendix, artifact number 12 and 13).

The groundstone sample included a mano and a metate. Both were manufactured from sandstones. The mano is bifacially ground and wedge-shaped in cross section, connoting extensive use wear. The metate was utilized unifacially for grinding. The worked surface had a ground basin.

No bone or shell was present on the surface of this site.

The site has been grazed and lightly to moderately exposed. Cultural material may occur in blowouts to the east, but these are not definitely cultural. Some paleosol is present in the bottom of the blowout and along the dune faces. All artifacts but the caliche occur in the bottom of the blowout on the paleosol. Moderate potential for intact deposits exists along the blowout edges. Site integrity is impossible to assess on the basis of presently available data.

5.2.32 Site: MA235B-32; LA 54388

Location: T22S, R31E, S34, SE 1/4

Previous Study: None

The site consists of many ash stains, plus some pottery and fire-cracked rock. The materials lie in a large blowout situated on a very low rise. The lack of time diagnostic artifacts hampers delineation of time period and culture. The ash stains, fire-cracked rock, and ceramic sherds reflect food preparation activity.

Spatial distinctions in artifact distributions involve the northwest area with three hearths and pottery; the central area with four hearths, pottery, and one piece of burned sandstone; and the southeast area with two hearths and a piece of burned caliche (Figure 5.13).

Unlike other sites in the WIPP area, hearths at this site are represented by ash-filled basins without thermofacts. In addition to the seven stains, the two pieces of fire-cracked rock may indicate one or two additional hearths. The burned caliche and burned sandstone occur in the bottom of the blowout and may have experienced erosion. The basin hearths are located only

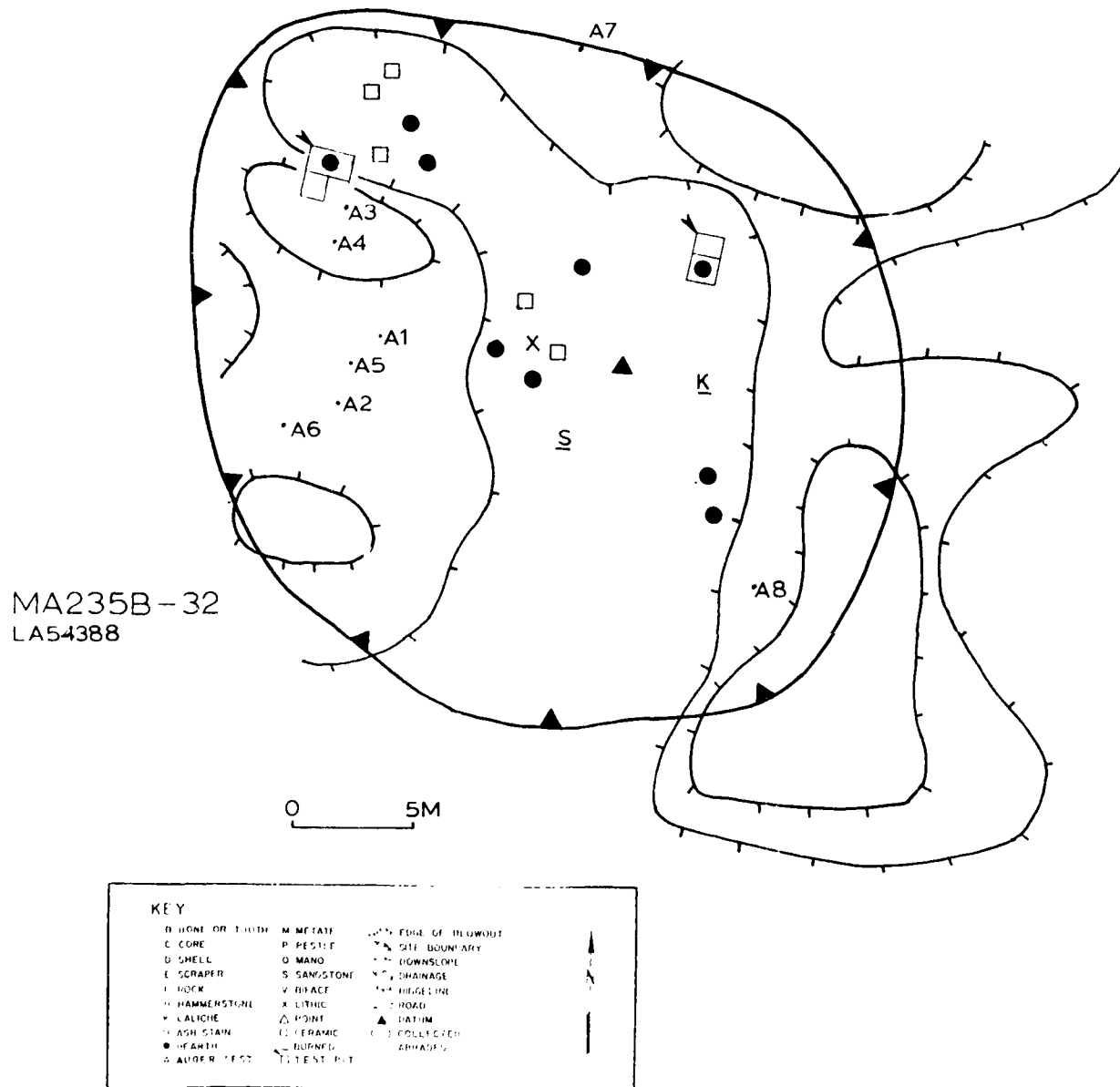


Figure 5.13 MA235B-32/LA 54388, WIPP Assessment Study, ACOE, 1986.

about 10 m to 20 m above the bottom of the blowout and are in original stratigraphic position.

No lithics were observed. This is the only site in the project area that did not produce any surface lithic samples.

This site produced three sherds, two of which were from Jornada Brown jars, with one sherd from a brown slipped vessel that was badly eroded. The types suggest a date in the A.D. 200-1350 range, which spans the Hueco through Maljamar phases.

No bone or shell was located on the site surface.

The site has been grazed and lightly to moderately exposed. It is judged to be perhaps 100% intact. Little evidence of paleosol is present. The potential for intact deposits is excellent.

5.2.33 Site: MA235B-33; LA 54389

Location: T23S, R31E, S4, SE 1/4

Previous Study: None

The site consists of fire-cracked rock, mineralized bone, and chipped stone in a single very large blowout with southern exposure. The Occupation may date to the PaleoIndian or Early/Middle Archaic period, based on a Bajada-like point, advanced mineralization of the bone, and the large size of the flakes. The bones and burned caliche reflect food processing. The chipped stone indicates some lithic manufacture.

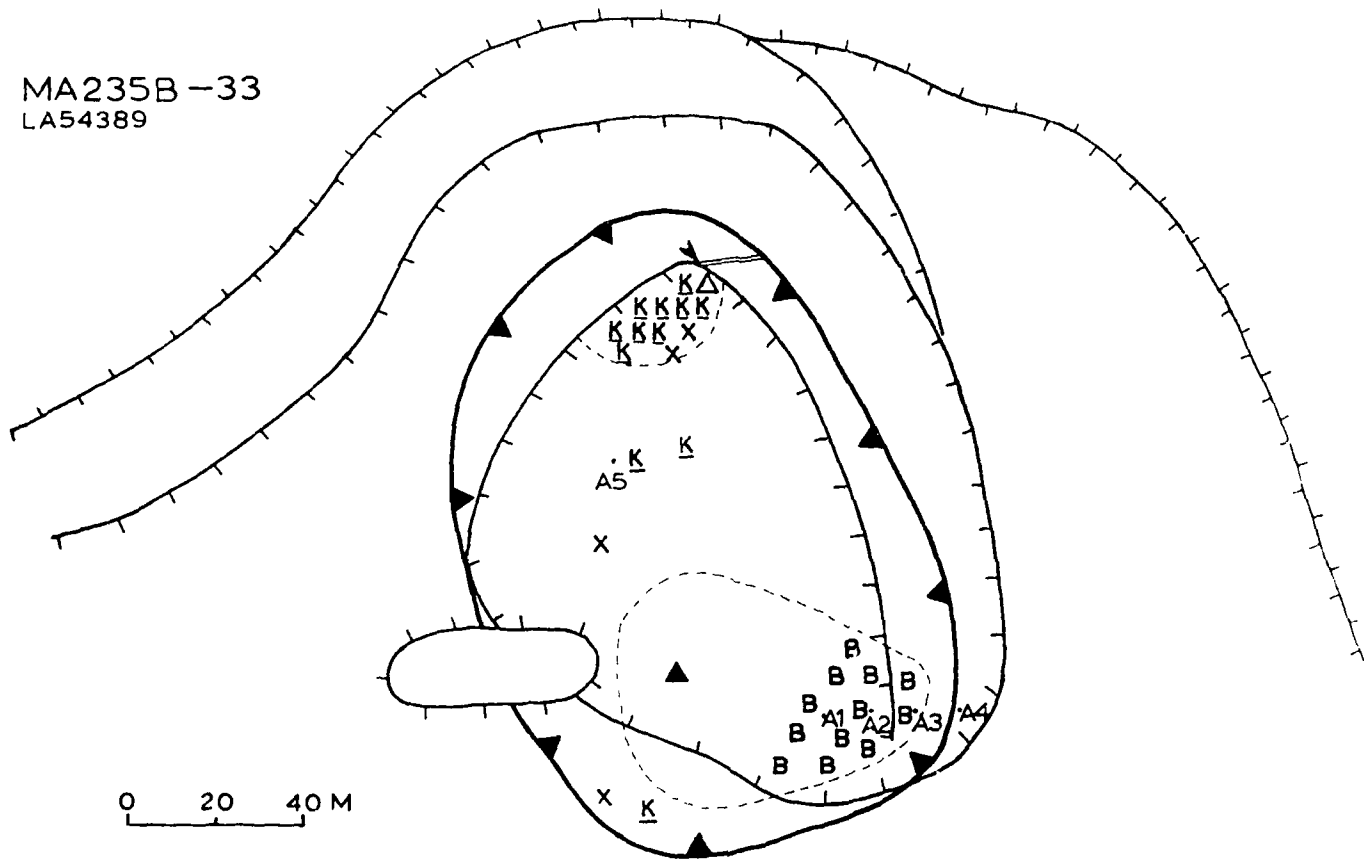
The two subareas of the site are the southern locus, containing mineralized bone and one piece each of chipped stone and burned caliche and the northern locus, containing fire-cracked rock, chipped stone, and the Archaic point (Figure 5.14).

The scatters of fire-cracked rock, primarily burned sandstone, suggest the presence of from six to seven hearths. The north locus, in which most of the fire-cracked rock occurs, appears to be mostly eroded.

The lithic assemblage included five debitage pieces, one projectile point, one hammerstone and two groundstones. One core flake and four biface flakes constituted the debitage sample. No cortex was present on four (80%) of the flakes; one flake retained 40% cortex. No edge modification was observed on any of the flakes. Recorded thickness ranged from 1 mm to 14 mm. All debitage was produced from chalcedony.

A point interpretable as an Early Archaic Bajada type dart point or Yarbrough type point was collected (Artifact 14, Appendix B). It was extensively reworked. One silicified sandstone hammerstone was itemized. Battering was present on the cobble's end.

MA235B-33
LA54389



KEY

| | | |
|-----------------|-------------|-----------------|
| B BONE OR TOOTH | M METATE | — EDGE OF BLOWN |
| C CORE | P PESTLE | — SITE BOUNDARY |
| D SHELL | O MANO | — DOWNSLOPE |
| E SCRAPER | S SANDSTONE | — DRAINAGE |
| F ROCK | V DIFACE | — MOULDER |
| H HAMMERSTONE | X LITHIC | — ROAD |
| K CALICHE | △ POINT | ▲ DATUM |
| ○ ASH STAIN | □ CERAMIC | — COLLECTED |
| ● HEARTH | — BURNED | — GRAVEL |
| A AUGER TEST | — TEST PIT | |

Figure 5.14 MA235B-33/LA 54389, WIPP Assessment Study, ACOE, 1986.

Two sandstone metates comprised the groundstone sample. Both were evaluated as slab metates, being less than 34 mm in thickness. They were unifacially ground and the worked surfaces were planoid in cross-section.

All bone observed was mineralized, mildly opalized, quite hard, and polished by sandblasting, with replacement fairly complete. The fragments are probably from artiodactyl limbs of antelope to extinct bison size. The bone fragments are concentrated in the south locus. Breakage of bone and its spatial association with fire-cracked rock and chipped stone are consistent with a cultural interpretation of its origin.

A dark red and orange paleosol is present in the bottom of the blowout. Components are spatially but not necessarily temporally distinct since artifacts occur at about the same level in the bottom of the blowout and 2 m to 3 m up the eastern slope. In addition, many pebbles comprising the desert pavement on paleosol appear to have been smashed. Additional very sparse material is present in a large blowout to the east. Most flakes are bifacial. A slab metate fragment is also present.

The site has been grazed and moderately exposed. It is judged to be 5% intact. The Bajada-like point may date the site to the Late Early/Early Middle Archaic period. The size and degree of mineralization of the bone suggests the possibility of an earlier PaleoIndian occupation. The greatest potential for intact deposits appears to lie in the south locus.

5.2.34 Site: MA235B-34; LA 54390

Location: T22S, R30E, S24, NW 1/4

Previous Study: None

The site consists of a scatter of fire-cracked rock and several lithics and ceramics. The site is in a series of connected blowouts on the long slope draining towards Hill Tank. Most of the site has been badly eroded by aeolian action and slopewash; a partially intact portion was selected for monitoring (Figure 5.15). Chupadero Black-on-white sherds date the site to Mogollon IV-V; and additional components may once have been present. The fire-cracked rock, sherds, and groundstone represent food preparation. The lithic debitage represents some lithic manufacture.

Artifacts are most common on the western side of the site, but artifact distributions have been greatly affected by aeolian and water erosion, making it likely that artifacts on the eastern half of the site have been washed away. No statements about site subareas or structure can be made.

Three partially articulated hearths are marked by concentrations of burned cobbles. One or more pieces of fire-cracked rock in three other areas of the site may represent three additional hearths. A very sparse scatter of fire-cracked rock, estimated at $1/100 \text{ m}^2$, continues in all directions from the monitored area.

The observed lithic assemblage included three debitage artifacts and two groundstone implements. Lithics were monitored from only one locus due to

AD-A194 815

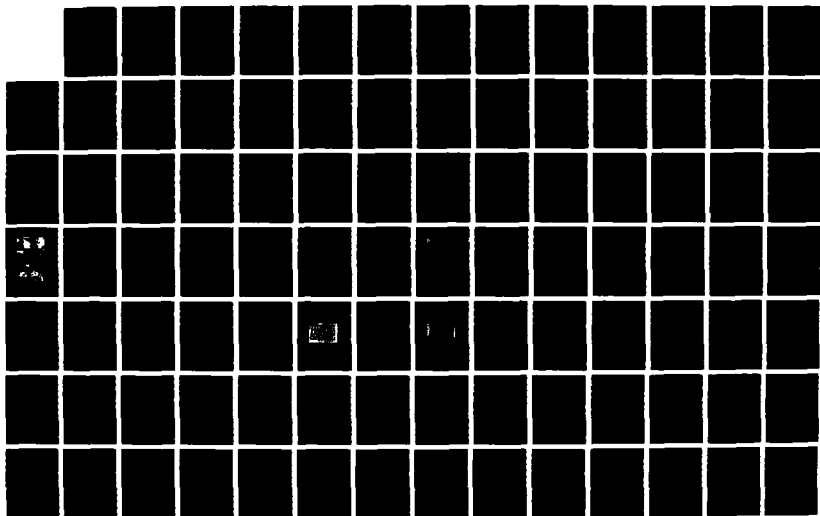
REPORT OF CLASS II SURVEY AND TESTING OF CULTURAL
RESOURCES AT THE WIPP (U) MARIAH ASSOCIATES INC
ALBUQUERQUE NM J C ACKLEN ET AL. MAY 87

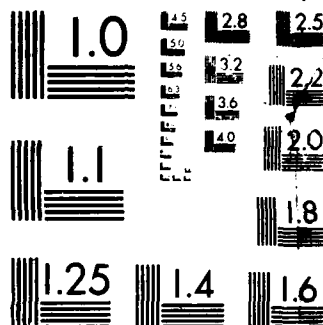
2/3

UNCLASSIFIED

F/G 5/6

NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

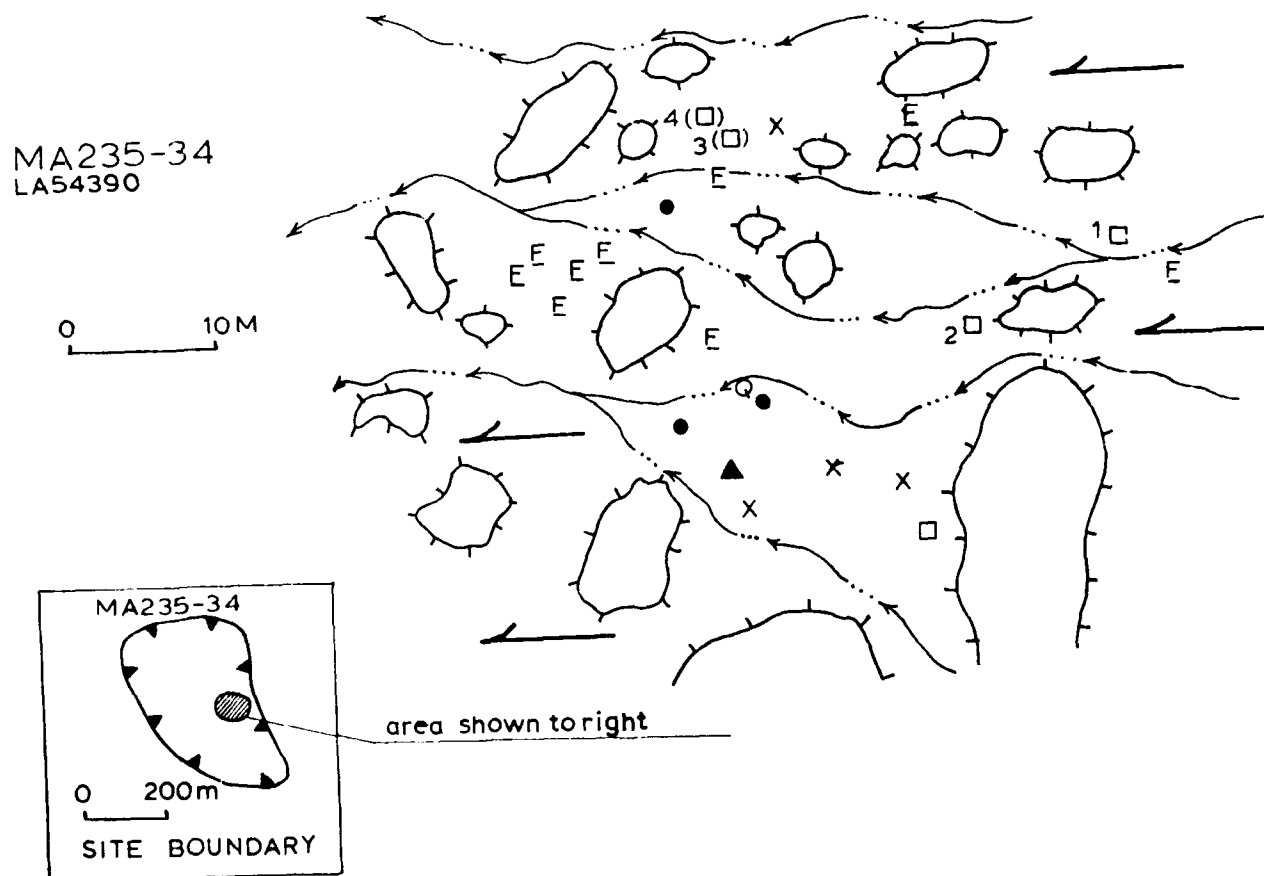


Figure 5.15 MA235B-34/LA 54390, WIPP Assessment Study, ACOE, 1986.

extensive site size and the eroded condition of the site. This locus consisted of artifacts surrounding an intact hearth.

The debitage sample included one biface flake and two angular debris fragments. The flake had no cortex. None of the examined debitage exhibited edge modification. Thickness was not measurable. Cherts were the only material types used. The groundstone samples yielded a mano and an unknown fragment. Both examples were sandstone and the surfaces were bifacially ground.

The site contained five sherds. These were three Chupadero whitewares, one painted and two unpainted, a Jornada Brown sherd and a San Andres Red-on-terracotta sherd, all from jars. These types would date the site to the AD 200-1450 period, covering all four phases of occupation.

No bone or shell was visible on the site surface.

Most of the site is badly eroded from aeolian and colluvial action. The site is judged to have very low integrity. The only diagnostics found (Chupadero Black-on-white) may not be representative of the original range of occupations at this site, since the site is near LA 54363 and seems to resemble the latter in setting and contents. Although the site is eroded, the articulated hearths and adjacent low dune relicts may retain some intact deposits.

5.2.35 Site: MA235B-35; LA 54391

Location: T21S, R31E, S35, SE 1/4

Previous Study: None

The site consists of a scatter of fire-cracked rock and articulated hearths with a scatter of chipped stone. The site is located in a single high dune crest blowout. The absence of time diagnostic artifacts makes determination of the site's time period and culture difficult. Activities carried out at the site included food preparation (based on the burned rock) and lithic reduction.

Site assemblage is homogeneous and limited in spatial extent. The fire-cracked rock is evenly distributed over the southwest half of the site and no obvious breaks in distribution are evident in the surface materials.

Three articulated hearths are marked by burned caliche concentrations at the edge of the blowout. An additional three or more hearths may be represented by scatters of burned caliche and burned sandstone. Materials are eroding out of the blowout at about 0.5 m to 1.0 m above the blowout bottom.

The lithic assemblage yielded nine debitage artifacts and one core. The debitage inventory consisted of five core flakes and four biface flakes. No cortex was present on seven (78%) of the flakes. Two (22%) flakes had 100% cortex coverage on the dorsal surface. No retouch or utilization was noted for 89% of the flakes. Only one flake was utilized. Measurable thicknesses

were all less than 3 mm in dimension. The material type range included cherts (56%), siltstone (22%), silicified sandstone (11%) and chalcedony (11%).

A chalcedony core was noted. The flake removal method produced a multifaceted surface morphology having no remaining flake potential. This is one of ten sites that yielded no groundstone.

No bone or shell was visible on the site's surface.

The site is judged to be 50% or more intact despite aeolian erosion. Deposition is definite, indicated by the articulated hearths, and is most likely at the edges of the blowout, which are stabilized by vegetation, predominantly oak.

5.2.36 Site: MA235E-36; LA 54392

Location: T21S, R31E, S35, SE 1/4

Previous Study: None

The site consists of scatters of fire-cracked rock, groundstone, and chipped stone in three unconnected blowouts in close proximity. The blowouts are in the south margin of an ovate mobile dune field. The lack of time diagnostic artifacts makes the site culture and period of occupation difficult to determine. The hearths and groundstone reflect food preparation. The lithics, which include a core and two scrapers, may indicate wood manufacturing as well as lithic reduction.

The amount of materials per blowout is directly related to the depth and size of the blowout, suggesting that the visible materials are not necessarily representative of those deposited. Each of the three blowouts contains chipped stone. The central blowout contains a scatter of burned caliche. The eastern blowout contains a small pebble bipolar reduction area and four pieces of groundstone, as well as other items.

Features include the bipolar reduction area, a grinding assemblage represented by three manos and a metate, and one to three hearths, represented by burned caliche and burned sandstone, all in the eastern blowout. At least one additional hearth exists in the central blowout and consists of a burned caliche scatter. Many of the features may be partially intact as materials occur well above the bottoms of blowouts.

The recorded lithic assemblage yielded 24 debitage pieces, 1 scraper, 3 hammerstones, 1 uniface and 4 groundstone implements. The debitage sample was 14 core flakes, 5 biface flakes, 3 bipolar flakes, and 1 angular debris fragment. No cortex was present on 61% of the flakes. On remaining flakes dorsal surface cortex percentage values ranged from 5 to 100%. Dorsal surfaces with 100% cortex coverage amounted to 22% of the sample. No edge modification was noted for 71% (17) of the sample; six (25%) specimens were utilized and one (4%) retouched. A diversity of thickness values was represented in the debitage sample. Thicknesses less than 3 mm accounted for 63% of the specimens. Other values were evenly distributed up to 15 mm. The bipolar flakes produced a broad range of thickness values (3 mm, 8 mm & 15

mm). Material types included cherts (71%), chalcedony (21%) and silicified sandstone (8%).

A complete end scraper was noted. Three silicified sandstone hammer/pecking stones were recorded. The hammerstone was fire cracked, and both pecking stones exhibited extensive battering. The silicified sandstone cobble uniface displayed extensive use wear.

The groundstone sample was comprised of three manos and one metate. All were manufactured from sandstone except for one caliche mano. One mano was bifacially ground. The slab metate was of portable type, small and exceptionally thin.

The site's lithic assemblage is characterized by several specific attributes that distinguish it from other sites observed in the project area. These include bipolar reduction utilizing the small chert pebbles in proximity to the site, the high quality of biface reduction, and the high frequency of tools and utilized flakes.

An eroded piece of artiodactyl tooth enamel is associated with the assemblage in the eastern blowout. No shell was found on the surface of this site.

The site is judged to be 50% intact, having been lightly exposed by aeolian erosion. The site probably lies primarily within the uneroded dune ridge approximately 2 m below the crest. Cultural materials are present well up the slopes of the central and eastern blowouts, as much as 1 m above the bottom of the blowout. Deposition is very likely.

Unusual characteristics of the lithic assemblage include utilization of bipolar shatter from small local pebbles, high quality biface reduction, and an unusually high frequency of formal tools and utilized flakes and scatter. The pebble reduction renders this site almost unique in the area and clearly significant.

5.2.37 Site: MA235B-37; LA 54393

Location: T21S, R31E, S23, SE 1/4

Previous Study: None

This site comprises a small scatter of chipped stone and burned caliche in a single blowout. The blowout is situated on a knoll at the end of a ridge with a northeast overlook to Rockbottom Tank. The absence of time diagnostic artifacts makes determination of time periods and culture difficult. Lithic reduction and food preparation activities are indicated by chipped stone and burned caliche, respectively.

Two tiny pieces of burned caliche on opposite sides of the ridge in the center of the blowout suggest the possible presence of two hearths.

The lithic assemblage yielded five debitage implements. The debitage inventory consisted of two core flakes, one biface flake and one angular

debris fragment. Two flakes had no cortex; the remaining had a nominal percentage of cortex on the surface. No edge modification was noted for 80% of the debitage. One piece exhibited utilization damage. Thickness values ranged from 1 mm to 5 mm. Material type variability included cherts (60%), chalcedony (20%) and silicified sandstone (20%). This is one of ten sites in the project area that contained no groundstone.

No bone or shell was visible on the surface of the site.

The site has experienced very little erosion and appears to be 80% intact. It is likely that the site extends some distance to the east and contains considerable cultural deposition at the edges of blowouts.

5.2.38 Site: MA235B-38; LA 54394

Location: T21S, R31E, S23, SE 1/4

Previous Study: None

This site consists of six hearths plus lithics, two sherds, and two metate fragments. The materials are located in a series of six unconnected blowouts on a knoll with overlook potential in every direction except southeast. The occupation is believed to be Mogollon and to postdate AD 200, based on the drill diameter and brownware sherds. Site activities included food preparation (based on the groundstone and hearths), lithic manufacture, and other manufacture (two scrapers and a drill).

All of the hearths are located at the south end of the site, which also features the greatest artifactual diversity, including flakes, a scraper, a biface, and sherds. Other scrapers and a core are located at the north end of the site (Figure 5.16).

At least six articulated hearths are present.

An unusually high proportion of core flakes and composite flake-tools characterize this site. The observed lithic assemblage included 11 debitage samples, 1 drill, 2 scrapers, 1 hammerstone, 1 uniface, and 3 groundstones. Of the debitage, 91% (10) were core flakes and one was an angular debris fragment. No cortex was present on 50% of the flakes. On other specimens cortex percentages varied up to 100% presence. No edge modification was observed on 82% of the debitage. Two specimens were utilized. Thickness values varied up to 12 mm although 80% were less than 3 mm in dimension. Material type diversity included chalcedony (55%), cherts (27%), siltstone (9%) and rhyolite (9%).

A chert drill and two chert scrapers were recorded. One scraper was bifacially retouched and the other denticulated. The chert hammerstone exhibited end battering damage from being utilized as a pecking stone. The uniface was manufactured from a silicified sandstone. The groundstone inventory consisted of three sandstone metate fragments (see Appendix C-6).

MA235B - 38
LA54394

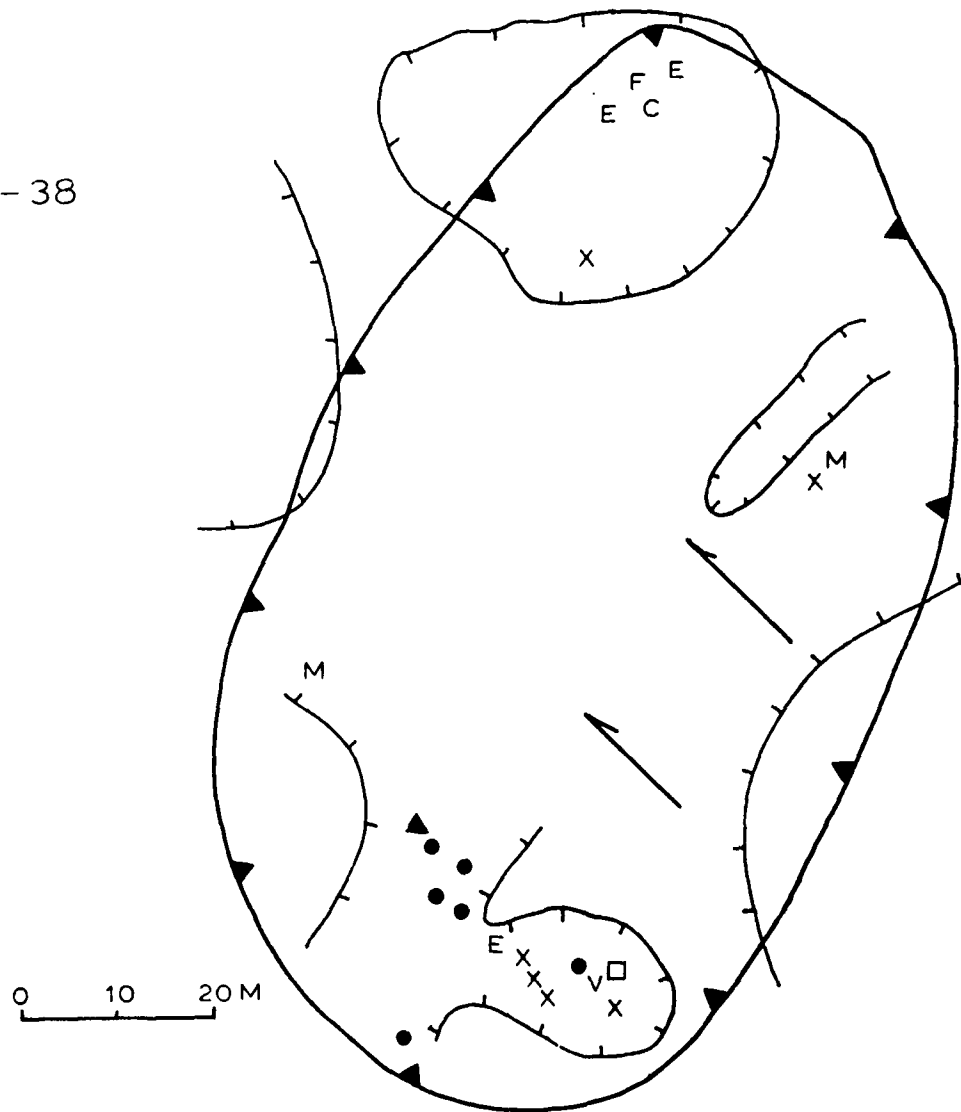


Figure 5.16 MA235B-38/LA 54394, WIPP Assessment Study, ACOE, 1986.

This site produced two sherds, both from El Paso Brown jars. This type would date the site to the A.D. 200-1350 period and encompass the Hueco to Maljamar phases of occupation.

No bone or shell was visible on the surface of this site.

The site contains numerous intact features and may be a smaller single-component version of LA 54363. Deposition is clearly present in areas between blowouts and in the blowouts themselves. Site integrity is judged to be 75% intact.

5.2.39 Site: MA235B-39; LA 54395

Location: T22S, R31E, S5, SE 1/4

Previous Study: None

This site consists of a scatter of burned caliche with a few chipped stone tools and a metate fragment. The materials are located in two unconnected blowouts in close proximity on a high dune ridge with southern overlook. The absence of time diagnostic artifacts makes the culture and period of occupation difficult to determine. Activities at the site included food preparation (groundstone and burned caliche) and lithic and possibly skin or wood manufacture (debitage and two scrapers).

Materials are too sparse to make statements about site structure or subareas.

Features, as indicated by burned caliche, number at least three, with two of those located in the large blowout.

The observed lithic assemblage included one flake, one scraper, a denticulate and a groundstone. The biface flake had 20% cortex and displayed no edge modification. Thickness was 2 mm in value. Material type was chert.

The chert scraper may have had a composite use as a denticulate. Two retouched notches were evident. The chert biface fragment was also notched. The groundstone sample consisted of a sandstone slab metate fragment.

No bone or shell was visible on the surface of this site.

Materials are sparse, but most chipped stone is in the form of tools. The site seems to resemble other dune-top blowout sites in the study area. Deposition may exist in blowout margins. Site integrity is probably high but impossible to estimate without testing.

5.2.40 Site: MA235B-40; LA 54396Location: T22S, R31E, S5, NE 1/4Previous Study: None

This site consists of burned rock, chipped stone, and two metate fragments. The materials are located in a single blowout on the eastern end of dune ridge with poor access. The lack of time diagnostic artifacts makes the culture and period difficult to determine. Activities at the site included food preparation (burned rock and groundstone) and lithic reduction.

The materials are too few and too concentrated to suggest site structure or subdivisions.

The burned caliche and one piece of burned sandstone may represent a hearth, probably eroded.

The lithic assemblage included seven debitage artifacts and one groundstone. The debitage sample included two core flakes, one biface flake and four pieces of angular debris. No cortex was present on any of the flakes. No edge modification was observed on any of the debitage. The thickness value for the measurable flakes (2) was 2 mm. Debitage material type was all chert. The groundstone sample consisted of one very thin sandstone metate.

No bone or shell was located on the surface of this site.

The debitage assemblage is composed primarily of high quality chert angular debris. Deposition is possible in the edges of blowouts. Site integrity cannot be assessed on the basis of presently available data.

5.2.41 Site: L; 16633 (ENM 10408)Location: T22S, R31E, S34, SW 1/4Previous Study: Reported (Schermer 1978). Only location amended in this report.

This site was encountered on the present survey, but it was judged to lie in the southwest quarter of Section 34, outside the sample unit. We believe Schermer's (1978:16) reported UTM easting is too large by 90 meters; our plotting of the site's location agrees substantially with the official Laboratory of Anthropology plotting of the site's location-a few meters west of the quarter section boundary. The site was not recorded in the present study, as it is otherwise described by Schermer (1978). It appears to consist of a fairly large cimiento or jacal structure of three or four rooms, although the caliche and groundstone alignments noted may have occurred naturally.

5.3 Isolated Occurrences

Isolates encountered on the WIPP survey (Table 5.1) occurred in four different kinds of physiographic settings (Table 5.2). The isolated occurrences consisted primarily of chipped stone, followed by burned caliche,

Table 5.1 Isolated Occurrence Description by Landform, WIPP Assessment Study, ACOE, 1986.

| I.O. # | Physiographic Setting | Description |
|-------------|---------------------------------------|---|
| MA235B-10-1 | dune blowout | simple hearth/ash stain |
| 2 | dune blowout | chalcedony flake |
| 3 | dune blowout | chert secondary flake |
| 4 | dune blowout | chert secondary flake |
| 5 | dune blowout | 4-5 pieces burned caliche |
| 6 | dune blowout | chert core flake |
| 7 | dune blowout hardpan | secondary chert flake |
| 8 | dune blowout | fire-cracked sandstone mano |
| 9 | dune blowout | small concentration of burned caliche and an exhausted chert core |
| 10 | dune blowout | Edwards Plateau Marshall/BM II point |
| 11 | dune blowout hardpan | 3 pieces burned caliche and 1 piece chipped stone |
| 12 | dune blowout | 3 pieces burned caliche |
| 13 | dune blowout | unifacial exhausted chert core |
| 14 | dune blowout | 2 pieces sandstone and 1 Alibates-like core flake |
| 15 | dune blowout with western exposure | 1 piece burned caliche |
| 16 | arroyo | silicified sandstone core flake fragment |
| 17 | dune blowout with eastern exposure | 2 tertiary chert flakes |
| 18 | drainage | basin metate fragment |
| 19 | flats | chert scraper flake |
| 20 | flats | purple glass bottle base |
| 21 | flats | 8 pieces burned caliche |
| 22 | alluvial flats | Chupadero B/W mug lug, 6 stove legs, lap seam baking powder can, survey stake |
| 23 | flats | chert flake fragment and 2 pieces burned caliche |
| 24 | slight slope | silicified sandstone core flake, silicified sandstone flake fragment, chert flake scraper/notch, Alibates-like biface flake |
| 25 | slight slope | Alibates-like biface flake and 2 pieces burned caliche |
| 26 | dune blowout hardpan | exhausted chert core |
| 26b | dune blowout | sandstone mano fragment |

Table 5.1 (continued)

| I.O. # | Physiographic Setting | Description |
|--------|---|---|
| 27 | dune blowout | sandstone metate fragment, secondary chert core flake, chert core flake fragment |
| 28 | dune blowout | concave chert scraper |
| 29 | dune blowout paleosol | 3 pieces burned caliche |
| 30 | dune blowout | secondary chert core flake & chert biface tip |
| 31 | dune blowout on stabilized plain | chert flake fragment |
| 32 | dune blowout on stabilized plain | secondary chalcedony core flake |
| 33 | dune blowout | 2 pieces burned caliche |
| 34 | dune blowout | chalcedony biface flake |
| 35 | dune blowout | 5 pieces burned caliche |
| 36 | dune blowout | 2 pieces burned caliche |
| 37 | shallow dune blowout | siltstone/chert decortication flake |
| 38 | dune blowout | 1 silicified sandstone flake fragment, 1 secondary jasper flake, 2 pieces burned caliche |
| 39 | dune blowout on eastern side of ridge line | 1 secondary core flake 1 brownware sherd |
| 40 | dune blowout | secondary chert core flake |
| 41 | dune blowout | chert flake |
| 42 | ? | 1 piece burned caliche and 1 siltstone core flake fragment |
| 43 | mesquite flats, dune blowout | mano fragment |
| 44 | dune blowout | chert flake fragment |
| 45 | dune blowout on mesquite plain | Scallorn point |
| 46 | dune blowout | chert core flake fragment, 2 silicified wood core flakes, chalcedony core flake fragment, chalcedony biface flake |
| 47 | dune blowout | sandstone groundstone fragment |
| 48 | dune blowout on mesquite flats | Marshall point |
| 49 | stabilized dune ridge | chalcedony core flake and 1 piece burned caliche |
| 50 | blowout at edge of active dune ridge | silicified sandstone biface flake |

Table 5.1 (continued)

| I.O. # | Physiographic Setting | Description |
|--------|---|---|
| 51 | dune blowout on northern side of large dune ridge | multifacet core and 2 pieces burned caliche |
| 52 | dune blowout on stabilized mesquite plain | chert core flake |
| 53 | dune blowout on north side of dune ridge | 3 chalcedony core flake fragments, heat treated hammerstone, secondary silicified sandstone core flake, sandstone mano fragment, 1 piece burned caliche |
| 54 | | |
| 55 | dune blowout | chalcedony biface flake and eroded groundstone fragment |
| 56 | dune blowout | multifacet chert core |
| 57 | dune blowout | baking powder can used as a mug |
| 58 | dune blowout | chert angular debris, sandstone metate fragment, unburned caliche pile, possible ash lens |
| 59 | dune blowout | bifacially flaked cobble and unmodified caliche chunk |
| 60 | dune blowout | 4 pieces burned caliche |
| 61 | dune blowout | silicified sandstone decortication flake |
| 62 | leeward side of dune crest | chert scraper |
| 63 | low ridge top | chert biface fragment |
| 64 | 4 dune blowouts | 4 pieces burned caliche |
| 65 | road along low ridge | chert flake scraping tool |
| 66 | road on ridge top | 15 pieces burned caliche |
| 67 | road on low ridge top | silicified sandstone biface and uniface, several pieces burned caliche |
| 68 | dune blowout | chert core flake |
| 69 | rill in semi-stable pediment | 6 pieces burned caliche |
| 70 | dune blowout | chalcedony core flake |
| 71 | dune blowout | burned sandstone mano fragment and burned caliche concentration |
| 72 | dune pediment | stove fragment |

Table 5.1 (continued)

| I.O. # | Physiographic Setting | Description |
|--------|------------------------------|------------------------------------|
| 73 | dune blowout | 2 pieces burned sandstone |
| 74 | dune blowout | chalcedony secondary core flake |
| 75 | 15 cm above dune pediment | chert cortical flake |

Table 5.2 Isolated Occurrences - Grouped Physiographic Settings, WIPP Assessment Study, ACOE, 1986.

| Setting | Frequency | Percent |
|--|-----------|---------|
| Dune blowout/dune ridge | 56 | 77 |
| Road/arroyo/rill/drainage | 6 | 8 |
| Flats/slight slope | 7 | 10 |
| Low ridge top/dune crest/dune pediment | 4 | 5 |

groundstone, historical artifacts, sherds, and ash stains. The isolate contents did not vary appreciably for the four types of landforms.

Eighty-five percent of the isolates occurred in settings (blowouts, roads, arroyos) that have experienced light to heavy erosion. Because of the extensive shin oak and mesquite ground cover, archaeological visibility was greatest in areas that have experienced erosion. When the 15% uneroded land surface is compared to the 85% eroded terrain producing isolates, groundstone is underrepresented and historical artifacts are somewhat overrepresented in the former category. The scarcity of groundstone in uneroded terrain is probably related to poor visibility in this setting although greater wind exposure in uneroded terrain may have resulted in less use of these areas.

The greater frequency of historical artifacts in uneroded terrain may relate to easier accessibility to these flat and nonblowout areas by horse or car than to blowout areas. Relatively large artifacts such as stove legs could also relate to favorable visibility conditions. The relatively recent deposition of historical artifacts also increases visibility. The datable historical artifacts, the purple glass (1880-1917) and the lap seam baking powder can used as a mug (1930s) (Ward et al. 1977: 249 and 261) confirm use of the project area during the transition from widespread cattle ranching to irrigation farming, homesteading, and mining activities.

The chipped stone isolates are primarily core flakes, with a few tools (scrapers, points, hammerstones, unifaces, and bifaces), biface flakes, and cores. Burned caliche isolates usually occur in concentrations of two to eight pieces and may be associated with a flake, groundstone fragment, or chipped stone tool. Groundstone and chipped stone pieces occurred together in several instances but were not common. Isolates containing more than one type of material were rare.

5.4 SURVEY SUMMARY

5.4.1 Surface Lithic Artifact Summary

The total surface recorded lithic assemblage in the project area amounted to 530 artifacts. Of those specimens, 66% were debitage. Lithic tools accounted for 12%, and groundstone for 22% of the sample. Only the 26 sites with more than five lithic artifacts will be used in comparative evaluations in this section. Tables summarizing lithic assemblage characteristics are in Appendix C. Included are drawings of formal tools.

5.4.1.1 Debitage

The recorded debitage sample included 282 flakes, 3 bipolar flakes and 65 pieces of angular debris (Table 5.3). Debitage contributed 50% or more to the lithic assemblage in all sites with comparable lithic data. Half of most sites had an assemblage consisting of more than 70% debitage. Debitage was characterized by noncortical dorsal surfaces on 75% of the lithic sample throughout the project area.

Core flakes composed 68% of the sample. Only 25% of the debitage assemblage consisted of biface reduction flakes (Table 5.4). Of sites with more than five pieces of debitage, only two (LA 54363 and LA 54391) had less than 60% core flake representation. The densest assemblage in the project area-LA 54363-was composed of 45% core flakes. While its surface was not 100% inventoried, this site's relatively high proportion of biface flakes may be of significance. The core/biface proportions observed throughout the project area suggest that there was selection for interior core flakes. Their presence is disproportionately high compared to the frequency of primary flakes and final reduction sequence items.

Retouched and utilized flakes are generally rare in the project area (Table 5.5). Edge modification was recorded for only 8% of all flakes. The high proportion of utilized flakes in LA 54362 and LA 54392 may relate to an increased tool presence - in both cases twice the average. The dense lithic sites, with more potential for flake variability, had (except for LA 54392) 100% unmodified flake inventories. The lack of edge modification is not a bias resulting from small sample sizes. Retouched flakes were related in random fashion with both tool diversity and density.

Flake thickness distributions exhibited no unusual patterns (see lithic Table 5.6). Overall flake thickness ranged evenly from 1 mm to 12 mm in dimension. Very thin and very thick flakes are relatively rare. Sites with large sample sizes displayed the same variance pattern. Only two sites had atypical thickness values. LA 54385 had a higher incidence of thick flakes, while LA 54392 had thin flake dimensions.

5.4.1.2 Tools

Tool distribution was classified into nine types including projectile points, drills, scrapers, cores, hammerstones, choppers, anvils, denticulates and unifaces. Regardless of site size, formal tools were generally not Table

Table 5.3 Lithic Artifact Types by Site, WIPP Assessment Study, ACOE, 1986.

| SITE | Small | | | | Hammer- | | | | | | | | | | | | Unl- | | | | Other | | | | Total |
|------|---------|--------|---------|--------|---------|--------|--------|--------|----------|-------|--------|----------|--------|---------|-------|-------|---------|---------|--------|---------|-------|--------|--------|--------|-------|
| | Angular | | Bipolar | | Flakes | Debris | Points | Drills | Scrapers | Cores | stones | Choppers | Anvils | Notches | faces | Manos | Metates | Ground- | stones | Pestles | Arti- | | | | |
| | Lithic | Lithic | Lithic | Lithic | | | | | | | | | | | | | | | | | | Lithic | Lithic | Lithic | |
| 1 | 7.0 | 58.3 | 3.0 | 25.0 | 0.0 | 0.0 | 1.0 | 8.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 12.0 | | |
| 2 | 3.0 | 50.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 6.0 | | |
| 3 | 1.0 | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | | |
| 4 | 1.0 | 50.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 50.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | | |
| 5 | 3.0 | 60.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 20.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5.0 | | |
| 6 | 13.0 | 46.4 | 8.0 | 28.6 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 3.6 | 1.0 | 3.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 28.0 | | |
| 7 | 37.0 | 42.0 | 12.0 | 13.6 | 0.0 | 0.0 | 2.0 | 2.3 | 0.0 | 0.0 | 1.0 | 1.1 | 1.0 | 1.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 14.0 | 15.9 | 11.0 | 88.0 | | |
| 8 | 1.0 | 20.0 | 1.0 | 20.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5.0 | | |
| 9 | 9.0 | 90.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 10.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 10.0 | | |
| 10 | 16.0 | 57.1 | 3.0 | 10.7 | 0.0 | 0.0 | 1.0 | 3.6 | 0.0 | 0.0 | 2.0 | 7.1 | 1.0 | 3.6 | 0.0 | 0.0 | 2.0 | 7.1 | 0.0 | 0.0 | 0.0 | 0.0 | 28.0 | | |
| 11 | 15.0 | 78.9 | 2.0 | 10.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 5.3 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 5.3 | 0.0 | 19.0 | | |
| 12 | 19.0 | 59.4 | 3.0 | 9.4 | 0.0 | 0.0 | 1.0 | 3.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 7.0 | 21.9 | 2.0 | 32.0 | | |
| 13 | 13.0 | 48.1 | 1.0 | 3.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 3.7 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 3.7 | 6.0 | 22.2 | 2.0 | 7.4 | 27.0 | | |
| 14 | 1.0 | 33.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 33.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 33.3 | 0.0 | 0.0 | 0.0 | 3.0 | | |
| 15 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 50.0 | 1.0 | 50.0 | 0.0 | 2.0 | | |
| 16 | 2.0 | 66.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 33.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.0 | | |
| 17 | 14.0 | 58.3 | 2.0 | 8.3 | 0.0 | 0.0 | 1.0 | 4.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5.0 | 20.8 | 0.0 | 0.0 | 24.0 | | |
| 18 | 0.0 | 0.0 | 4.0 | 33.3 | 0.0 | 0.0 | 1.0 | 8.3 | 0.0 | 0.0 | 1.0 | 8.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 16.7 | 2.0 | 16.7 | 1.0 | 12.0 | | |
| 19 | 28.0 | 66.7 | 9.0 | 19.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 2.4 | 1.0 | 2.4 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 2.4 | 2.0 | 4.8 | 0.0 | 42.0 | | |
| 20 | 5.0 | 50.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5.0 | 50.0 | 0.0 | 0.0 | 0.0 | 10.0 | | |
| 21 | 5.0 | 50.0 | 2.0 | 20.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 10.0 | 1.0 | 10.0 | 0.0 | 10.0 | | |

Table 5.3 (continued)

| SITE | Small | | | | | | | | | | Hammer- | | | | | | | | | | Uni- | | | | Other | | Total | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|---------|--------|--------|--------|---------|---------|---|---|---|---|---------|--------|--------|--------|----------|-------|--------|----------|--------|---------|-------|-------|---------|--------|---------|--------|-------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Angular | | | | | Bipolar | | | | | Flakes | Debris | Points | Drills | Scrapers | Cores | stones | Choppers | Anvils | Notches | faces | Manos | Metates | stones | Ground- | Lithic | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Debris | Flakes | Debris | Debris | Angular | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Table 5.4 Reduction by Site, WIPP Assessment Study, ACOE

| Site No. | Total Flakes | Context | | | | Core | | | | Flake Type | | | | Platforms | | | |
|----------|-----------------|----------|---------|----------|-----------|----------|---------|----------|-----------|------------|-------|--------|------|-----------|-------|----------|-----------|
| | | 3' - 30% | | | | 31 - 70% | | | | Flake | | | | Total | | | |
| | | 0 | 1 - 30% | 31 - 70% | 71 - 100% | 0 | 1 - 30% | 31 - 70% | 71 - 100% | Flake | Blade | Biface | Unk. | Flake | Flake | Flake | Retouches |
| | | / | X | / | X | / | X | / | X | / | X | / | X | / | X | / | X |
| 1 | 7 100 | 5 | 71 | - | - | 2 | 29 | - | - | 2 | 100 | - | - | - | - | 4 100 | 2 50 |
| 2 | 3 100 | 2 | 67 | 1 | 33 | - | - | - | - | 2 | 67 | - | 1 | 33 | - | 2 100 | 1 50 |
| 3 | 1 100 | - | - | - | - | - | - | - | - | - | - | - | 1 | 100 | - | - | - |
| 4 | 1 100 | - | - | - | - | 1 | 100 | - | - | 1 | 100 | - | - | - | - | 1 100 | - |
| 5 | 3 100 | 1 | 33 | 2 | 67 | - | - | - | - | 3 | 100 | - | - | - | - | 2 100 | - |
| 6 | 13 100 | 6 | 46 | 3 | 23 | 2 | 15 | 2 | 15 | 12 | 92 | 1 | 8 | - | - | 10 100 | 2 20 |
| 7 | 39 100 | 34 | 87 | 3 | 8 | - | - | 2 | 5 | 13 | 45 | - | 16 | 55 | 10 | 20 100 | 2 10 |
| 8 | 1 100 | - | - | - | - | - | - | 1 | 100 | 1 | 100 | - | - | - | - | - | - |
| 9 | 9 100 | 6 | 67 | 1 | 11 | - | - | 2 | 22 | 6 | 67 | - | 3 | 33 | - | 6 100 | - |
| 10 | 15 100 | 6 | 38 | 5 | 31 | 2 | 13 | 2 | 13 | 12 | 81 | 1 | 6 | 2 | 15 | 10 100 | 2 20 |
| 11 | 15 100 | 11 | 73 | 1 | 7 | 1 | 7 | 2 | 13 | 14 | 93 | - | 1 | 1 | - | 11 100 | 2 10 |
| 12 | 19 100 | 15 | 79 | 4 | 21 | - | - | - | - | 16 | 84 | - | 3 | 16 | - | 17 100 | 3 15 |
| 13 | 13 100 | 10 | 77 | 2 | 15 | 1 | 8 | - | - | 9 | 69 | - | 4 | 31 | - | 8 100 | 1 10 |
| 14 | 1 100 | 1 | 100 | - | - | - | - | - | - | 1 | 100 | - | - | - | - | - | - |
| 15 | 2 100 | 2 | 100 | - | - | - | - | - | - | 1 | 50 | - | 1 | 50 | - | 2 100 | - |
| 17 | 14 100 | 12 | 86 | 1 | 7 | 1 | 7 | - | - | 10 | 71 | - | 3 | 21 | 1 | 7 8 100 | - |
| 19 | 28 100 | 26 | 93 | 2 | 7 | - | - | - | - | 17 | 61 | - | 11 | 39 | - | 17 100 | 2 10 |
| 20 | 5 100 | 4 | 80 | - | - | 1 | 20 | - | - | 3 | 60 | - | 2 | 40 | - | 3 100 | - |
| 21 | 5 100 | 3 | 60 | 1 | 20 | 1 | 20 | - | - | 5 | 100 | - | - | - | - | 5 100 | - |
| 22 | 4 100 | 4 | 100 | - | - | - | - | - | - | 3 | 75 | 1 | 25 | - | - | 4 100 | - |
| 23 | 1 100 | 1 | 100 | - | - | - | - | - | - | - | - | - | 1 | 100 | - | - | - |
| 24 | 4 100 | 3 | 75 | 1 | 25 | - | - | - | - | 1 | 25 | - | 3 | 75 | - | 2 100 | - |
| 25 | 1 100 | 1/- | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 26 | 1 100 | 1 | 100 | - | - | - | - | - | - | - | - | - | 1 | 100 | - | 1 100 | - |
| 27 | 5 100 | 5 | 100 | - | - | - | - | - | - | 3 | 60 | - | 2 | 40 | - | 4 100 | - |
| 28 | 1 100 | 1 | 100 | - | - | - | - | - | - | 1 | 100 | - | - | - | - | - | - |
| 29 | 12 100 | 11 | 92 | - | - | 1 | 8 | - | - | 9 | 75 | - | 2 | 17 | 1 | 8 10 100 | - |
| 30 | 4 100 | 2 | 50 | 2 | 50 | - | - | - | - | 4 | 100 | - | - | - | - | 2 100 | 1 50 |

Table 5.5 Utilization and Marginal Retouch on Debitage (Flakes and Angular Debris), WIPP Assessment Study, ACOE

| Site | <u>Unretouched</u> <u>Nonutilized</u> | | <u>Unretouched</u> <u>Utilized</u> | | <u>Utilized</u> <u>Retouched</u> | | | | | | <u>Total</u> | |
|-------|--|-----|---------------------------------------|-----|-------------------------------------|---|----------|---|------|-----|--------------|-----|
| | | | | | Unidirec- | | Bidirec- | | Both | | | |
| | | | | | tional | | tional | | | | | |
| | # | % | # | % | # | % | # | % | # | % | # | % |
| 1 | 7 | | 1 | | 2 | | | | 30 | 100 | 10 | 100 |
| 2 | 3 | 100 | 0 | 0 | | | | | | | 3 | 100 |
| 3 | 1 | 100 | 0 | 0 | | | | | | | 1 | 100 |
| 4 | | 0 | 1 | 100 | | | | | | | 1 | 100 |
| 5 | 2 | 0 | 1 | | | | | | | | 3 | 100 |
| 6 | 17 | | 3 | | 1 | | | | 19 | 21 | 100 | |
| 7 | 48 | | 0 | 0 | | | 1 | | | | 49 | 100 |
| 8 | 1 | | 1 | | | | | | | | 2 | 100 |
| 9 | 8 | 0 | 1 | | | | | | | | 9 | 100 |
| 10 | 18 | | 0 | 0 | | | | | | | 18 | 100 |
| 11 | 15 | | 2 | | | | | | 12 | 17 | 100 | |
| 12 | 22 | 100 | 0 | 0 | | | | | | | 22 | 100 |
| 13 | 14 | 100 | 0 | 0 | | | | | | | 14 | 100 |
| 14 | 1 | 100 | 0 | 0 | | | | | | | 1 | 100 |
| 16 | 2 | 100 | 0 | 0 | | | | | | | 2 | 100 |
| 17 | 16 | 100 | 0 | 0 | | | | | | | 16 | 100 |
| 18 | 4 | 100 | 0 | 0 | | | | | | | 4 | 100 |
| 19 | 35 | | | | 1 | | | | | | 36 | 100 |
| 20 | 5 | 100 | 0 | 0 | | | | | | | 5 | 100 |
| 21 | 6 | 100 | 0 | 0 | 1 | | | | | | 7 | 100 |
| 22 | 7 | 100 | 0 | 0 | | | | | | | 7 | 100 |
| 23 | 1 | 100 | 0 | 0 | | | | | | | 1 | 100 |
| 24 | 4 | 100 | 0 | 0 | | | | | | | 4 | 100 |
| 25 | not analysed | | | | | | | | | | | |
| 26 | 1 | 100 | 0 | 0 | | | | | | | 1 | 100 |
| 27 | 5 | | 0 | 0 | 1* | | | | | | 6 | 100 |
| 29 | 1 | 100 | 0 | 0 | | | | | | | 1 | 100 |
| 29 | 15 | 100 | 0 | 0 | | | | | | | 15 | 100 |
| 30 | 4 | 100 | 0 | 0 | | | | | | | 4 | 100 |
| 31 | 4 | 100 | 0 | 0 | | | | | | | 4 | 100 |
| 33 | 5 | 100 | 0 | 0 | | | | | | | 5 | 100 |
| 34 | 3 | 100 | 0 | 0 | | | | | | | 3 | 100 |
| 35 | 8 | | 1 | | | | | | | | 9 | 100 |
| 36 | 17 | | 6 | | 1 | | | | 29 | 24 | 100 | |
| 37 | 4 | | 1 | | | | | | | | 5 | 100 |
| 38 | 9 | | 2 | | | | | | 15 | 11 | 100 | |
| 39 | 1 | 100 | 0 | 0 | | | | | | | 1 | 100 |
| 40 | 7 | 100 | 0 | 0 | | | | | | | 7 | 100 |
| Total | 321 | 92 | 20 | 6 | 10 | 2 | 1 | 0 | 0 | 0 | 349 | 100 |

*nonutilized @ 2 nonutilized

Table 5.6 Thickness of Complete Flakes by Site, WIPP Assessment Study, ACOI

| Centimeters | | 0<T<=1 | | 1<T<=3 | | 3<T<=6 | | 6<T<=12 | | 12<T | | Total | |
|-------------|---|--------|----|--------|-----|--------|-----|---------|-----|------|-----|-------|-----|
| Site No. | | # | % | # | % | # | % | # | % | # | % | # | % |
| 1 | - | - | - | 1 | 25 | 1 | 25 | 1 | 25 | 1 | 25 | 4 | 100 |
| 2 | - | - | - | 2 | 100 | - | - | - | - | - | - | 2 | 100 |
| 4 | - | - | - | - | - | 1 | 100 | - | - | - | - | 1 | 100 |
| 5 | - | - | - | - | - | - | - | - | - | 1 | 100 | 1 | 100 |
| 6 | - | - | - | 5 | 56 | 2 | 22 | 1 | 11 | 1 | 11 | 9 | 100 |
| 7 | 2 | 12 | - | 4 | 24 | 6 | 35 | 5 | 29 | - | - | 17 | 100 |
| 9 | - | - | - | 2 | 40 | 1 | 20 | 2 | 40 | - | - | 5 | 100 |
| 10 | - | - | - | 1 | 14 | 4 | 57 | 2 | 29 | - | - | 7 | 100 |
| 11 | - | - | - | 3 | 50 | - | - | 3 | 50 | - | - | 6 | 100 |
| 12 | 2 | 18 | - | 2 | 18 | 3 | 27 | 2 | 18 | 2 | 18 | 11 | 99 |
| 13 | 2 | 50 | - | - | - | 2 | 50 | - | - | - | - | 4 | 100 |
| 16 | - | - | - | - | - | 1 | 50 | 1 | 50 | - | - | 2 | 100 |
| 17 | - | - | - | 4 | 57 | 2 | 29 | 1 | 14 | - | - | 7 | 100 |
| 19 | 6 | 40 | - | 4 | 27 | 1 | 7 | 4 | 27 | - | - | 15 | 101 |
| 20 | 1 | 50 | - | - | - | 1 | 50 | - | - | - | - | 2 | 100 |
| 21 | - | - | - | - | - | 1 | 33 | 2 | 67 | - | - | 3 | 100 |
| 22 | - | - | - | - | - | 2 | 100 | - | - | - | - | 2 | 100 |
| 24 | - | - | - | - | - | 1 | 50 | 1 | 50 | - | - | 2 | 100 |
| 26 | - | - | - | 1 | 100 | - | - | - | - | - | - | 1 | 100 |
| 27 | - | - | - | 1 | 50 | - | - | 1 | 50 | - | - | 2 | 100 |
| 29 | - | - | - | 2 | 18 | 2 | 18 | 7 | 64 | - | - | 11 | 100 |
| 30 | - | - | - | - | - | - | - | 1 | 100 | - | - | 1 | 100 |
| 31 | - | - | - | - | - | - | - | - | - | 1 | 100 | 1 | 100 |
| 33 | 1 | 25 | - | 2 | 50 | - | - | - | - | 1 | 25 | 4 | 100 |
| 35 | - | - | - | 6 | 100 | - | - | - | - | - | - | 6 | 100 |
| 36 | 4 | 21 | - | 8* | 42 | 3 | 16 | 2* | 11 | 2* | 11 | 19 | 101 |
| 37 | 1 | 33 | - | - | - | 2 | 67 | - | - | - | - | 3 | 100 |
| 38 | - | - | - | 4 | 80 | 1 | 20 | - | - | - | - | 5 | 100 |
| 39 | - | - | - | 1 | 100 | - | - | - | - | - | - | 1 | 100 |
| 40 | - | - | - | 2 | 100 | - | - | - | - | - | - | 2 | 100 |
| Total | | 19 | 12 | 55 | 35 | 37 | 24 | 36 | 23 | 9 | 6 | 156 | 102 |

*Includes 1 bipolar flake

observed in high frequencies (see Table 5.3). Thirty-five percent of sites included at least one tool; only 20% had more than two tools. Many of the scrapers, cores, hammerstones and denticulates were noted as being composite tools. Fifty percent of the core sample was utilized. Tools with multifunctional use suggest intensive and reuse wear. The variance of the tool type frequency among sites exhibited no significant patterns.

High frequency tool types did not covary significantly or regularly with other tool type frequencies in a given site. Nor did tool type diversity and frequency patterns vary with debitage or groundstone frequencies. Between tools and debitage the only correlation is that those sites with low tool frequency tended to have low debitage frequencies.

An obvious correlation did exist between the co-occurrence of manos and metates among sites. As well, flakes and angular debris had a high ratio of co-occurrence.

Sites with no tool inventory were usually those with small lithic assemblages. However, the inverse was not true. High density lithic sites did not yield a proportionally higher tool frequency. The average tool frequency among all sites was 14%. The denser sites (LA 54362, LA 54363, LA 54366, LA 54368, LA 54369, LA 54375, and LA 54392) with assemblages greater than 25 lithic artifacts had tool frequencies well below this average of these sites only. LA 54366 had an above average tool frequency. The site with the greatest lithic density, LA 54363, had a tool incidence of only 5%. In sum, the data suggest that the middle range site sizes were the locus of relatively more extensive tool-related activities.

The observed lack of tools on the larger sites may be a product of their proximity to roads. Road access may have had an effect on amateur collection on sites in the project area. The larger sites are well known to the local populace, and easy access is feasible by an old pipe line road near LA 54363, LA 54368, and LA 54390. While the site sample with road access is too small to evaluate in terms of its effect on tool collection, there is a probability that the observed tool frequencies are biased on those sites. This biasing potential is supported by the archaeological interviews. (see Chapter 7.1).

5.4.1.3 Groundstone

Of the 119 pieces of groundstone recorded 46% were manos and 39% metates (attributes are summarized in Appendix C-6). One pestle and 16 unidentifiable fragments were inventoried. Groundstone was noted on 75% of the sites. On those sites with grinding implements, groundstone averaged 26% of the lithic assemblage. Only three sites (LA 54358, LA 54374, LA 54376) with at least 5 lithic items displayed frequencies greater than 40%. Five sites (LA 54357, LA 54365, LA 54366, LA 54375, and LA 54376) had proportionally lower frequencies (less than 10%). (LA 54363 was not included because of the biased sampling method.) These data may indicate some variance throughout the project area in locality selection for grinding activities. Many of the smaller sites yielded 50% to 100% groundstone frequencies. The overall higher frequency of manos as compared with metates may be explained by their portability. For example, LA

54368 and LA 54369 had a proportionally greater presence of manos. Factors other than portability (e.g., range of activities, frequency or duration of occupation) may also account for higher frequencies at these sites.

Most groundstone was manufactured from sandstone that varied in grain size. Only a few examples were produced from caliche or limestone. Use wear varied within and between sites. Some specimens were well worn, indicated by bifacial grinding faces, concave surfaces, and wedge-shaped cross sections, while others exhibited nominally utilized grinding surfaces. On denser sites with palimpsest occupations, the larger sized groundstones could exemplify permanent site furniture.

Small groundstone items could have been transported for use or indicate a specialized processing utility. The mano sample included pieces with rectangular and oval shapes. Shapes were not site specific. No temporal inference can be derived from their morphology. Metates included slab and basin forms. Groundstone morphological and use wear patterns appear distributed randomly across sites. The apparent lack of selection for particular groundstone type may indicate that both a diversity of grinding activities occurred during occupation and that no one site was the locus of a specific kind of processing. No evidence of in situ groundstone manufacture was observed. Some of the groundstone fragments were burned and had crazed surfaces. Discarded as grinding implements, they may have had a secondary function in stone boiling.

The intensity of grinding activities, as observed by artifact densities, may have varied from site to site. However, attribute characteristics do not emerge as being site specific.

5.4.1.4 Material Type

The distribution of material types across the project area was relatively homogeneous. While the overall frequencies of materials varied significantly, the variation pattern within sites was similar. Cherts, though variable in color and cryptocrystalline quality, constituted 40% of the material represented. Other material types included sandstone (19%), chalcedony (17%), silicified sandstone (14%), lime-stone/caliche (4%), silicified wood (2%), siltstone (1%), igneous (1%), jasper (1%), obsidian (1%) and conglomerates (1%). The debitage samples from most sites included specimens of chert, chalcedony and silicified sandstone. Cherts were almost always the dominant material type, with other materials utilized in lesser proportion. Other material classes appeared infrequently and seemingly at random.

That the pattern of material use among sites was fairly predictable may indicate a preference for certain materials. However, in part, the pattern may be reflective of proximity to local sources.

5.4.1.5 Lithic Sources

Lithic materials available for exploitation in the southeastern New Mexico area may derive from several sources: in-place deposits, cobble deposits, and long-range importation.

In-place deposits include excellent dolomites, cherts, jaspers, and chalcedonies available in the Permian and Triassic sandstone and limestone formations outcropping in the Guadalupe Mountains to the west, locally in the project area, and again at and beyond the margins of the Llano Estacado to the south and east. In addition, the local anhydrite (caliche) caprock provides an anhydrite limestone which occasionally is sufficiently indurated to serve as groundstone material. Finally, local resiliification occurring in the Ogallalah formation or in the overlying caliche caprock produces nodules of silcrete which grade occasionally into inferior opal.

Noteworthy among the Permian materials are the various so-called San Andres, Rock House, Macho, Central Texas, Edwards Plateau, and Georgetown chert, all of which occur in liesegang (banded), mottled, and monochrome variants in a range of blues, grays, browns, and yellows, and none of which are reliably distinguishable under macroscopic examination.

The full range of in-place materials just described, together with a wide variety of silicified sandstones and igneous forms, also occur in secondary deposits as cobbles in the Ogallalah formation, a multiple reworked Miocene alluvial deposit which generally overlies the Permian substrate in the Mescalero pediment and Llano Estacado; similar materials occur as Pecos River gravels. The Pecos River, of course, presently continues to transport weathering products from the southern Rockies, just as did the streams which laid down the Ogallalah.

Generally good mimics of true exotics (Alibates silicified dolomite, Tecovas/Quitaque Jasper) are known to occur in eastern New Mexico; Alibates encountered on this project is probably exotic, but "Tecovas" jasper occurs as cobbles within the project area.

Obsidian seems to be the only certain exotic or imported material encountered in this project; it is extremely rare.

5.4.1.6 Technology

Observation of the overall lithic assemblage suggests an adaptation selecting for a curated technology, specifically the maintenance of large interior flakes and cores. The lack of immediate availability of large amounts of quality lithic materials precluded the fostering of expedient lithic manufacture. A generalized pattern of curated technology is supported by the predominance of noncortical core flakes, the presence of cores - many exhausted and utilized - of composite tools, and the relative lack of final and primary lithic reduction sequences and of retouched or utilized flakes. These lithic assemblage attributes indicate that expedient tool manufacture was not a dominant activity in the project area.

Nominal evidence of retouch and biface reduction may in part be a product of visibility and artifact settling processes. Artifact settling processes affect site formation (Gifford 1978; Noeyersons 1978). Experiments in dunal environments have suggested that larger flakes settle at a faster rate than smaller flakes. We would then expect that the assemblages on the WIPP project

originally contained an even greater proportion of large flakes than is now visible. Gravity rather than aeolian forces may be the most important factor in altering dune site formation and obscuring actual flake type and size distributions (L. Wandsnider, personal communication 1986).

Subsurface sampling of those dunal areas that yielded few flakes used in tool manufacture could indicate whether the lack of biface reduction sequences results from site formation processes. While the percentage of monitored lithics may be biased, the presence of numerous unmodified interior core flakes is suggestive of a curated technology in which lithic goods were transported, perhaps cached, and later manufactured.

5.4.1.7 Site Size

Lithic density is related to the intensity of use and the potential diversity of artifact classes. Smaller sites are expected to yield less lithic variation, while denser sites have an increased variation potential. However, the correlation between number of artifact classes and the number of artifacts per site is not a direct lineal relation. Sites with high densities did not deviate significantly from the artifact type distributions seen in smaller sites (Figure 5.17).

While the number of lithic types represented cannot be predicted by site size, there is an optimal site size for high lithic diversity. Artifact classes were divided into debitage, nine tool types and groundstone. The most cohesive clustering concerned sites with samples varying from five to ten artifacts. These site samples contained from two to five artifact classes. No site had more than seven of the 11 artifact classes. Sites with an artifact range of 19-88 lithic items were included in the six class category. LA 54363, with a 48% greater lithic frequency than the next densest site, expressed no greater artifact diversity. Sites with fewer than five lithic pieces contained from one to four artifact classes.

While debitage, tool and groundstone densities differ with site size, their intersite percentages bear no relation to site size. In sum, site size is not indicative of lithic class distributions. The few perhaps aberrant sites in terms of lithic diversity were, within the site size continuum, smaller sites.

Site size, rather than site lithic assemblage attributes, appears to be the most salient variable in distinguishing sites within the project area. Smaller sites reflect ephemeral local use, while larger sites represent cumulative reoccupation.

Increases in site density suggest the recurrent performance of similar activities. Occupational activity diversity, as reflected by artifact diversity, is similar within the site size continuum. The lithic evidence does not substantiate an indication that activity diversity significantly increases with site size. Lithic density and variability seem to reflect temporal reuse and not activity or lithic specialization. The repetitive use of these places in the regional landscape may reflect a logistically organized subsistence system (Binford 1982:20). This use of the landscape within the

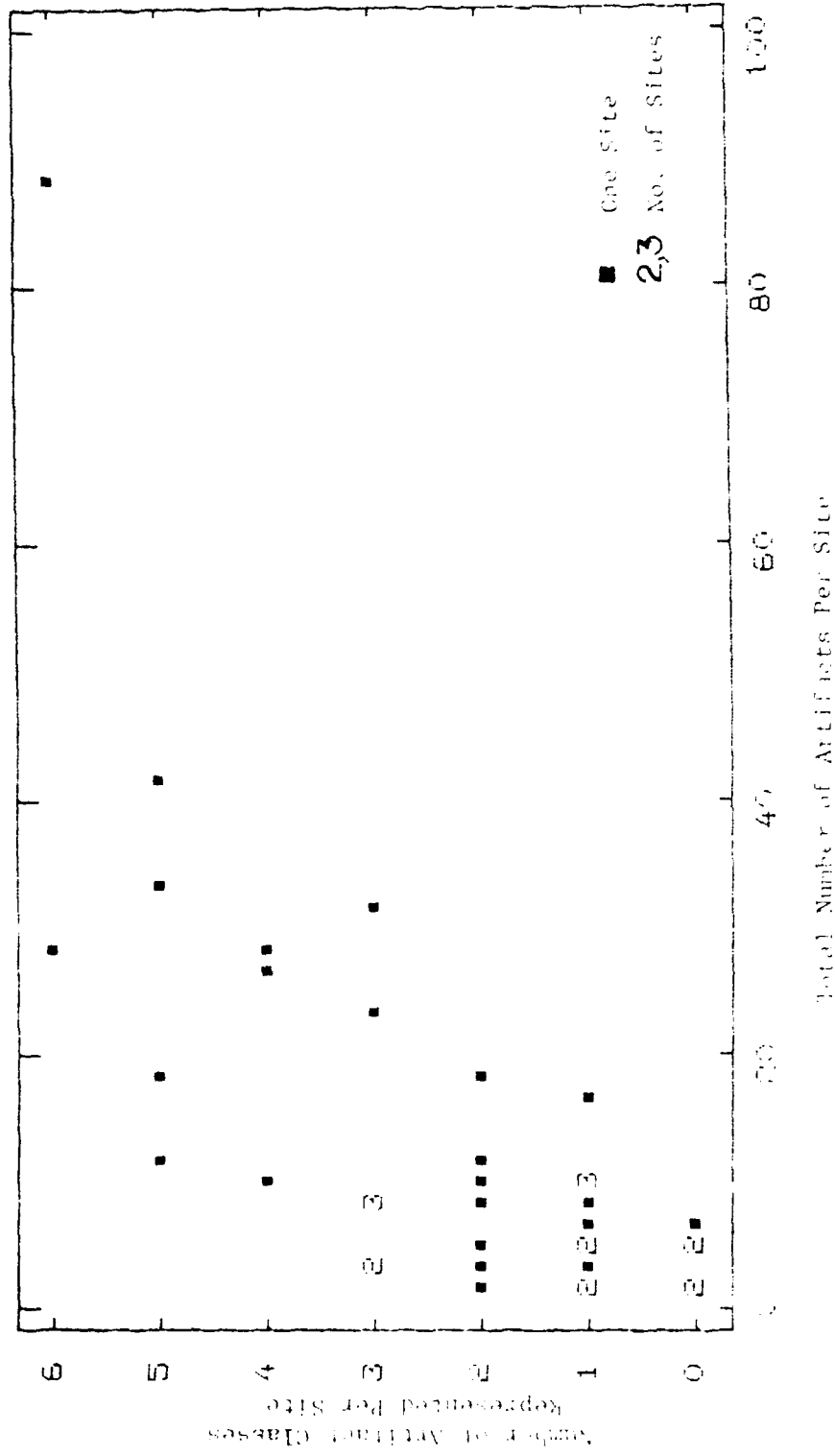


Figure 5.17 Site Lithic Artifact Density and Number of Artifact Classes, WIPP Assessment Study, ACOE, 1986.

project area has produced interest in the area and a more diversified economy.

Large site densities appear to be related to relatively low elevations and to a greater degree of particularization of the landscape. Intensive reoccupation and intensive site use in LA 1400? A factor of site density. Large sites are situated at high elevation, with a greater degree of particularization to water sources. These sites have high ethnic densities with low local frequency and ethnic habitation frequency. Land-use percentages varied according to response to site occupation overlaps of site occupation. Ethnic variability is difficult to interpret. However, these large sites appear to be the product of environmental conditions that are relatively favorable to intensive, diverse, reoccupancy or local habitation. The relationship of site density to ethnic density and ethnicity.

2.4.1.5 Sites with Interesting Lithic Assemblages

Small sites situated in the lowlands seem to have similar patterns of utilization. Examples include LA 51351, LA 51352, and LA 51353. Disturbed with a relatively small, little, scarce size of eight specimens in a number of cores. All of these cores were utilized and represent 90% of the total project area's utilized cores.

The floral assemblage of LA 1358 included 16 species, which all were native. The percentage of natives greater than 0.01 was unusually high. Representing 60% of the site's floral sample, this percentage is more than twice the average observed in all sites. The site also produced a high consistency in frequency.

[illegible][illegible]

Analysis of the outcomes from the WPP survey did not provide any attributes (instead of values) associated with the use of a particular type of protection against a particular hazard. The results were consistent with the hypothesis that the use of a particular type of protection is determined by the perceived risk of the hazard. The results also indicated that the use of a particular type of protection is determined by the perceived risk of the hazard. The results also indicated that the use of a particular type of protection is determined by the perceived risk of the hazard. The results also indicated that the use of a particular type of protection is determined by the perceived risk of the hazard.

Difficulties in typological classification have been noted by Rose (1979:194) and post-positional factors and local differences in pottery have been noted in brownware typology. For example, Rose (1979:194) notes that the "Jornada" type found primarily in the Maroon (Tribal-Native) area is made of a "local red clay and sandstone temper from a local source" which results in a friable, easily weathered surface. Some examples of pottery of this type are well polished, but most surfaces show a "rough, pitted, and granular texture" (Rose 1979:194-195 and 199). The wind and sand I have collected to produce many damaged sherd surfaces on other types. Rose's (1979:194) factor is especially sherd size, which hampers type and vessel identification. Rose (1979:194) notes that Rosewell and South Pecos brownwares are "classified largely on the basis of temper." On the other hand, Jornada and the "Jornada" type are "classified largely on the basis of surface polish" (Rose 1979:194). However, both of these surface finish, however, are all necessary to separate South Pecos from Jornada Brown since the latter occurs and it has the gray-buff surface typical of South Pecos Brown. Ceramic types identified on the VFA survey are listed in Page 5.7.

The data set of 92 snords consisted of 19 collected snords and 73 specimens found in the field. All but one of the snords were from sailing boats. Cluster analysis, a multivariate procedure for detecting natural groupings in data, was used to classify the snords. The type of cluster analysis used was K-means, which is not confined to hierarchical linkages. K-means clustering splits a set of objects into a selected number of groups by maximizing between-cluster variance to within-cluster variance. Hierarchical linkage clustering takes the distance between two clusters as the distance between the two closest members. Different numbers of groups were specified to find the best fit. Six clusters produced the best results in terms of grouping similar snords in one cluster.

A single linkage (nearest neighbor) clustering of the variables recorded during the ceramic analysis indicated that the samples could be best separated for distinguishing sister vessels on the basis of color, black, and black, beige, blue, red, and white colors. The other colors, gray,

treatment of the wide ceramic variability and the variability in nominal temper types and intersite variability.

This analysis focuses on the relationship between the cluster analyses of the surface treatment and temper variables. Surface treatment distinguishes many of the types defined for the project area, while temper is useful for separating some of the subtypes within types.

5.4.2.2__K means Cluster on Surface Variables

A k means cluster analysis on surface treatment and color, vessel form, and paste color was performed on the data set of 97 sherds. The k means cluster analysis used the variables of exterior and interior surface texture, exterior surface color, vessel form, paste color hue, and paste color intensity. Surface treatment was categorized on a continuum from corrugated, scraped, or rough to smoothed, polished, slipped, or painted. Exterior surface color was classed as either light brown/tan (characteristic of South Pecos Brown) (Frizell 1983: 285) or other. Paste color hue was grouped into red, brown, gray/brown or grey, and intensity ranged from pale to dark.

Of the three- to seven-class programs, the six-cluster analysis produced the best combination of low standard deviations and moderate-sized clusters (Table 5.8). The surface treatment/paste types are described as follows. Group 1 includes 13 sherds from LA 54363; 4 sherds from LA 54373; 1 sherd from LA 54374; 3 sherds from LA 54375; 2 sherds from LA 54390; and 2 sherds from LA 54391. These sites show no significant locational clustering. Three sites (LA 54373-54375) are located on the edge of a playa in the southeastern portion of the project area. Two sites (LA 54363 and LA 54390) are located above mill Tank in the western part of the project area. LA 54391, the final site in this cluster, is situated on a knoll in the northeastern part of the project area. The similar sherds from the two sites might derive from the same vessel, although no refit was noted in the field. The mean surface texture treatment is smoothed, exterior surface color is not light brown, and most vessels are probably jars. The paste color tends to be in the dark gray/brown to gray range. Most of these sherds are probably the Southern Area Brown variant of El Paso Brown (Leslie 1979:194), eight are Burned Brown, three are Intermediate brown, and two are Chapadero whitewares.

The second group consists of all five sherds from LA 54360 plus a sherd from LA 54362. The LA 54360 sherds are probably from the same vessel. The exterior surface is saucer-indent corrugated or eroded, in the case of the LA 54362 sherd, the interior surface is smoothed, and no bowl form was definitely present. Surface color is not the diagnostic tan. Paste color is dark brown to gray/brown. These sherds appear to be Genes Brown Indented (Figure 5.18).

Table 5.8 Ceramic Clusters on Surface Treatment/Paste/Form Variables, WIPP Assessment Study, ACOE, 1986.

| Cluster No. | Description |
|-------------|---|
| 1 | Smoothed surfaces Exterior surface color not light brown Primarily jars Paste dark gray/brown to dark gray Primarily El Paso Brown, some Jornada Brown |
| 2 | Smeared indented corrugated exterior surface Primarily jars Exterior surface color not light brown Primarily Ochoa Brown Indented |
| 3 | Polished exterior Primarily jars Half of the exterior surfaces light brown Primarily Jornada Brown |
| 4 | Rough exterior Primarily bowls Some exterior surfaces light brown Paste pale to medium gray to gray/brown Painted wares |
| 5 | Exterior surface slipped Interior surface polished Primarily jars Most exterior surfaces not light brown Dark gray paste Painted wares and Jornada Brown |
| 6 | Exterior slipped or painted Interior scraped or smoothed Exterior surface not light brown Jar or unknown form Pale gray paste Chupadero Black-on-white |

The third group consists of 26 sherds from 12 sites. Sites are LA 54357, LA 54358 (two sherds), LA 54362 (four sherds), LA 54363 (eight sherds), LA 54364, LA 54367, LA 54368 (three sherds), LA 54369, LA 54375 (two sherds), LA 54376, LA 54377, and LA 54388. These sites do not show any locational clustering or consistency in topographic setting. Unlike the first two clusters, this group identifies sherd variability across many sites. Exterior surface texture is most often polished, while interior surfaces are smoothed, suggesting that many of the vessel forms are jars. Perhaps half of the

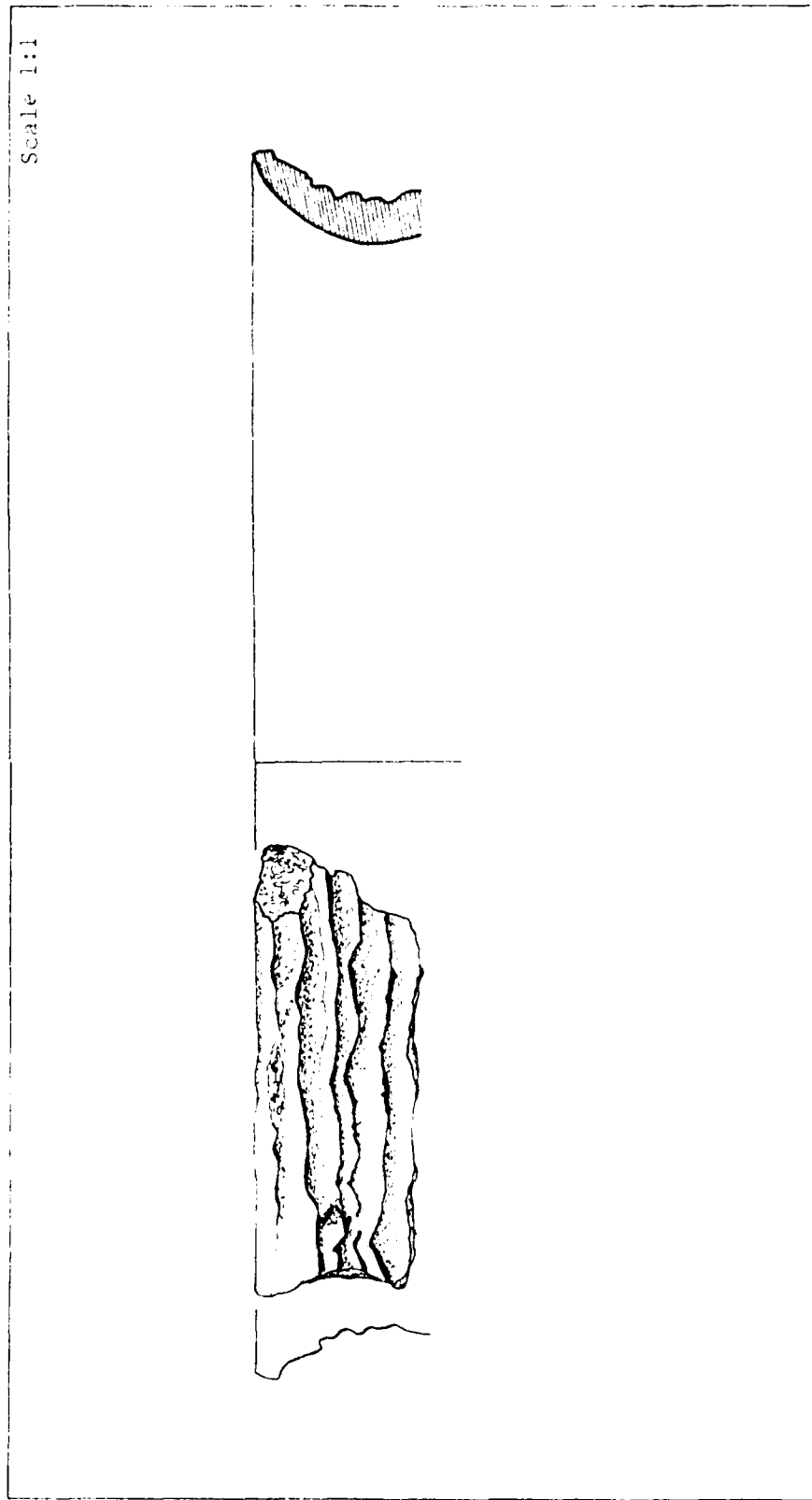


Figure 5.18 Ochoa Brown Indented Jar Rim Sherd, LA 54360, WIPP Assessment Study, ACOE, 1986.

exterior surfaces are light brown. The most common paste color is medium brown. These sherds represent Jornada Plain Brownware (Marshall 1973b), San Andres Red-on-terracotta, Three Rivers Red-on-terracotta, and South Pecos Brown along with four indeterminate brownwares.

The fourth group contains three sherds from LA 54362, LA 54363, and LA 54390. Exterior surfaces are rough and interior surfaces are slipped, suggesting that most of the forms are bowls. Some of the sherds possess the light brown exterior characteristic of South Pecos Brown. Paste color tends to be pale to medium gray to gray/brown. Sherds are El Paso painted ware, Chupadero Black-on-white, and San Andres Red-on-terracotta.

Cluster 5 consists of 22 sherds from seven sites, including 11 from LA 54363. Additional sites are LA 54362, LA 54368, LA 54369, LA 54375, LA 54388, and LA 54390. Locations and topographing settings of these sites do not show any particular clustering. Exterior surface texture ranges from polished to painted and is most often slipped, and interior surfaces received slightly less treatment, tending to be polished. While many sherds were classed as unknown form on the basis of curvature, surface treatment suggests that many of these were jars. Most sherds do not have light brown exteriors. Most common paste color is dark gray. Types include Chupadero Black-on-white, San Francisco Red/playas, Incised/unnamed red slipped brownware, San Andres Red-on-terracotta, El Paso painted wares, and Jornada Brown.

The sixth group contains three sherds from LA 54363, LA 54367, and LA 54369. All of these sherds are either slipped or painted on the exterior and scraped or smoothed on the interior. The exterior surface is not pale brown. The forms are either jars or unknown. Paste color is pale gray. These sherds all appear to be examples of Chupadero Black-on-white.

5.4.2.3 K-means Cluster on Temper Variables

A k means cluster analysis was performed on the variables of temper color and size. Of the two- to seven- cluster runs performed, the six-cluster analysis produced the best combination of relatively low standard deviations and moderate group sizes (Table 5.9). Cluster descriptions follow.

Cluster 1 contained 30 sherds. Forty-three percent of these were from the Jornada Plain Brown cluster defined on the basis of surface treatment attributes. Twenty percent were from the Ochoa Brown Indented and 20% from the El Paso Brown clusters. The remainder were from two clusters of painted wares. The cluster 1 temper averages 27% each large and medium white and 8-13% each large and medium gray; small white mica occurs in traces.

Cluster 2 contained only one sherd, which is probably Chupadero Black-on-white. It was categorized as mostly fine black temper with some medium black temper.

Cluster 3 consisted of 20 sherds. Forty-five percent appeared in the El Paso Brown surface treatment cluster and 40% in the Jornada Plain Brown cluster. The remaining three sherds were painted wares. Cluster 3 contains

48% large gray temper and 9-11% large, medium, and fine white along with medium gray. Mica occurred in small amounts.

Cluster 4 contained 24 sherds. Fifty-eight percent of these were painted wares. Thirty-three percent were from the El Paso Brown cluster and the rest are from the Jornada Plain Brown cluster. Cluster 4 averaged 56% medium gray temper, 22% small white, and 8-9% white and gray large temper, with traces of mica.

Cluster 5 consisted of 13 sherds. Thirty-eight percent of the sherds were from the El Paso Brown cluster, 23% are Chupadero Black-on-white, and 15% are from the Jornada Plain Brown cluster, with one sherd each from the Ochoa Brown Indented and the two painted ware clusters. Cluster 5 averages 52% small white temper and 17% medium gray, with less than 10% large and medium white, large and small gray, and small black temper.

Cluster 6 contained seven sherds. Seventy-one percent of these were from the El Paso Brown cluster, and the other two sherds were painted wares. Cluster 6 temper was 61% large white, 33% small white, and 4% large gray, with a trace of medium black.

Table 5.9 Ceramic Clusters on Temper Variables, WIPP Assessment Study, ACOE, 1986.

| Cluster No. | Description |
|-------------|---|
| 1 | 27% large white 27% medium white 8-13% large gray, medium gray, small white, traces mica |
| 2 | 75% small black 25% medium black |
| 3 | 48% large gray 9-11% large white, medium white, small white, medium gray, small amounts mica |
| 4 | 56% medium gray 22% small white 8-9% large white and large gray, traces mica |
| 5 | 52% small white 17% medium gray 2-10% large white, medium white, large gray, small gray, small black |
| 6 | 61% large white 33% small white 4% large gray, trace medium black |

5.4.2.4 Additional Ceramic Attributes

Additional relationships among ceramic attributes are as follows: large and medium gray temper were found both on jar and sherd, that were smoothed, polished, or slipped. Large and small white temper were most prevalent in smoothed and polished sherds.

Overall, the most common exterior surface texture was polish, followed by slip and smoothing. The most common interior surface texture was smoothing, followed by polish and slip. The frequencies support the general prevalence of jars over bowls.

5.4.2.5 Overall Ceramic Summary

The attribute-based analysis of the WIPP ceramics confirms in a systematic fashion many of the previously noted problems with the existing ceramic typology. Since the types are defined on the basis of only a few attributes, such as surface finish or temper, many of the types encompass a great deal of ceramic variability. If the classification were reliable, it would allow us to date sites containing sherds. Problems about the typology relate to the dating and definition of types from areas considerably north and west of the project area. In addition, the sand deposits in which most of the ceramics occur contribute to aeolian erosion on the sherd surfaces, implying that some Jornada Brown sherds could be classified as El Paso Brown on the basis of an absence of polish that relates to postdepositional wear rather than original sherd characteristics. Moreover, the Southern Area Brown El Paso variant which occurs in the project area has a particularly friable paste and is likely to produce small sherds that are difficult to classify.

The WIPP analysis supports the lack of temper distinction between El Paso and Jornada Brown based on size and color of temper inclusions (of course, surface finish, if present, may allow separation of the two types). Four of six temper clusters contained sherds of both types. Temper cluster 1 was most similar to temper variant 1 described by Fritzell (1985) for the Jornada-El Paso Brown series. No sherds were definitely classed as Roswell Brownware although it is possible that some of the sherds from temper clusters 1,3,4,5, and 6 with relatively high percentages of fine temper could be placed into this category. Typical Roswell brown is, however, rare in the Eastern Jornada (Leslie 1979:193). South Pecos brown is possibly present in temper clusters 4,5, and 6; one sherd from LA 94363 was identified as this type. Middle Pecos Micaceous was not present in the project area. No sherd contained more than 30% micaceous temper, and it is possible that what was identified as mica was actually micaceous schist.

All but one of the sherds from the tan to brown treated surface treatment cluster were also placed in temper cluster 1.

The two painted ware surface treatment clusters contained temper of all types except temper cluster 2. The majority of the painted wares were El Paso wares and Chupadero Black on White, with one San Francisco Red and one possible Three Rivers Red on terra cotta sherd. All of the Chupadero sherds in

surface treatment cluster 6 were placed into temper cluster 3, characterized by a predominance of fine temper. The Chupadero white ware sherd in surface treatment cluster 4 was included in temper cluster 5 with the three Chupadero sherds comprising surface treatment group 6. The El Paso painted wares were placed in temper clusters 1 and 6. The San Francisco Red sherd occurred in temper cluster 4.

Certain aspects of the ceramic analysis design should be changed in future attempts to differentiate brownware types. First, Munsell color designation of surface and paste color would be more reliable than unreferenced color designations. Such recording would be better suited to laboratory than to field analysis. Second, mineralogy of temper constituents would be more useful than color in distinguishing ceramic types. For example, both common feldspars and frosted quartz grains are white, but only the latter is commonly used in El Paso Brown and Polychrome (Regge Wiseman, 1987 personal communication). Finally, this analysis has demonstrated the range of variability in brownwares. Further studies should focus on analytical methods for reliably distinguishing the various brownware types.

Tying these ceramic types to locally obtained radiometric dates was possible only in the case of LA 54388, where two Jornada Brown sherds can be compared with three C-14 dates. The surface sherds were located in an area between the hearths which produced the C-14 samples. Additional surface sherds were mapped but not analyzed during the testing phase; the single subsurface sherd was too eroded to type but did not resemble the Jornada Brown sherds in characteristics that were present. Based on the macrobotanical results, which showed hearth contents to consist almost entirely of Prosopis (mesquite), the site appears to represent an extremely short term (overnight?) camping place. The relatively tight cluster of C-14 dates, given the small sample size, supports the interpretation of a short term stay.

Radiocarbon dates produced a corrected mean of AD 950 for this site (Section 6.2.1). This date is completely amenable to the traditional Lehmer (1948) chronology. Thus, the dates from LA 54388 do not contribute to the revision of the Jornada Mogollon chronology for southeastern New Mexico. They do, however, confirm the short term use of the project area during the AD 900-1000 period.

6.0 TESTING PHASE

Testing was carried out in February and March of 1986. A total of 11 sites were tested by crews composed of one archaeologist (Principal Investigator and Lithic Analyst), Jack Bertram (Principal Investigator, Field Director, Ceramic Analyst), Jon Frizell (Principal Investigator, Analyst), David McGuire (Lithic Analyst), and Steven Hoagland (Archaeologist).

The testing phase required a total of 140 person-hours, or just over 20 man days. Forms used in recording test results are in Appendix A.

6.1 TESTING STRATEGIES AND PROCEDURES

Testing strategies developed in consultation with ACOF and BLM archaeologists emphasized collection of chronometric, assemblage, and subsistence samples, and to a lesser degree, the depth and character of cultural deposits at selected sites recorded during the survey phase. A priority list developed before testing and continually modified in the field concentrated on suspected single component sites or formally characterizable feature types, especially those associated with diagnostic artifacts and potentially datable cultural deposits (Table 6-1). The purpose of the testing program was to correlate absolute dates with culturally temporally sensitive artifacts in a preliminary attempt to develop a regionally based chronology.

Primary emphasis was placed on LA 54368, a Mogollon site with visible hearths and a light scatter of cultural debris located in a single blowout. Of all the sites located during the survey, this site appeared to be the most promising in that: the site clearly retained chronometric potential; hearths were evenly spaced as might be expected on a single component site; and absolute dates obtained through radiocarbon analysis might be associated with poorly dated brownware ceramics.

Although LA 54363 clearly evidenced multiple occupations, it was afforded a high priority in that possible caliche alignments near the center of the site were thought to be the remains of trash structures. Structural remains in southeastern New Mexico are poorly documented at best, and unambiguous structural evidence would constitute a significant contribution to the region's prehistory.

LA 54289, although disturbed, was also afforded a high priority in that large sized biface flakes and mineralized bone suggested a PaleoIndian cultural affiliation. PaleoIndian occupation in the project area is only known from isolated finds. Fragmentation of a PaleoIndian site, leaving rapid erosion was considered a serious possibility.

LA 54374 was considered potentially important in that it appeared to be a single component Early Ceramic site with associated brownware and a corner-notched point in a single, possibly unroded undrafted dune blowout.

Although LA 54264 and LA 54266 were partially deflated and the latter was partially destroyed by a pipeline, both appeared to be single component

Table 6-1. Testing of 11 sites in the Effigy Mound Area, Vicksburg National Military Park, Mississippi.

| Priority | Site Number | Site Type | Cultural Affiliation | Condition | # Auger Tests | #m ² | Reason for Testing |
|----------|-----------------------|----------------------------------|----------------------|----------------------|---------------|-----------------|--|
| 1 | LA 54384 MA235B-52 | Lithic & ceramic scatter | Mogollon | Intact | 2 | 54 | Probable single component with hearth stains |
| 2 | LA 54387 MA235B-7 | Large lithic and ceramic scatter | Multi-component | Partially disturbed | 11 | 4 | Possible structures |
| 3 | LA 54389 MA235B-33 | Lithic scatter | Possible PaleoIndian | Partially disturbed | 5 | 1* | Unique resource |
| 4 | LA 54374 MA235B-18 | Lithic scatter | Early Ceramic | Intact | 19 | 0 | Possible undeposited single component |
| 5 | LA 54364 MA235B-8 | Lithic & ceramic scatter | Mogollan | Partially deflated | 3 | 2 | Probable single component |
| 6 | LA 54366 MA235B-10 | Lithic scatter | Archaic | Disturbed, partially | 10 | 0 | Possible single component deflated |
| 7 | LA 54375 MA235B-19 | Lithic & ceramic scatter | Mogollan | Intact | 5 | 1 | Intact ash lens with associated ceramics |
| 8 | LA 54385 MA235B-29 | Lithic scatter | Possible PaleoIndian | Partially deflated | 0 | 1 | Hearth intruded into paleosol |
| 9 | LA 54368 MA235B-12 | Lithic & ceramic scatter | Multi-component | Intact | 0 | 1 | Stacked rock hearth features |
| 10 | LA 54373 MA235B-17 | Lithic & ceramic scatter | Mogollan | Intact | 3 | 0 | Ash lens on possible single component |
| 11 | LA 54380 MA235B-24 | Lithic scatter | Archaic | Intact | 2 | 0 | Possible single component |

* One 15 m x 15 m test trench.

sites with associated diagnostics. Cultural occupation was suspected to occur in dune hummocks separating hardpan blowouts.

Although LA 54375 is probably a multicomponent site, ceramics could potentially be associated with an ash lens in a discrete blowout. At MA 235B-29, a possible PaleoIndian site, a hearth feature was intruded into a recognized paleosol. The hearth was excavated and the contents were collected in an attempt to provide potentially valuable geomorphological data and to date an anomalous lithic assemblage associated with mineralized bone.

LA 54368 is clearly a multicomponent site. It did, however, evidence some of the best examples of rock-filled hearths and was tested in an attempt to date that feature type.

Although LA 54373 was a dispersed scatter which may well have resulted from periodic reoccupation, it does contain temporally diagnostic artifacts and ash lenses. For these reasons it was tested to ascertain chronometric potential.

Finally, although located in contiguous dune blowouts, LA 54380 was felt to be potentially the result of a single unusual occupation which deposited an anomalously high proportion of formal tools. The site did yield a diagnostic artifact although no evidence of hearths or lensing was detected during survey.

Tests included auger probes and the excavation of 1 m pits and, in some instances, test trenches. All soils were screened through 1/4" hardware cloth; in feature excavation, soils were screened through 1/8" mesh. All test excavations were plotted on site maps using a transit and stadia rod. Soil characteristics were systematically described using standardized scientific terminology; soil color was described using a Munsell soil color chart. At least one wall of every test pit excavated was profiled and photographed. Informative plans and profiles are presented as illustrations in this section of the report. The remaining profiles were devoid of information content and are not included here. Prior to backfilling, the bottom of each test pit was lined with black plastic to indicate depth and placement; the surface of tested areas was restored as nearly as was possible to conditions prior to excavation.

All collected artifacts were cataloged according to Museum of New Mexico standards; all were analyzed. Although laboratory analysis essentially replicated in-field analysis described in Section 3.4.2.2, lab results should be viewed as more reliable. Lithics were examined using 10x magnification, and ceramics were analyzed with reference to published type description and type collections. Access to microcomputers permitted the use of multivariate statistical techniques and graphic displays. Lithic and ceramic artifacts are discussed by provenience and site in the body of the testing chapter.

6.2 TESTING RESULTS

6.2.1 LA 54388/MA 235B-32

A total of five 1 m units and eight auger tests was excavated at LA 54388. Test Pit 1 was a 1 m unit placed over a hearth stain visible on the surface; the unit was situated on the southern slope of a semiactive dune pediment along the northeastern perimeter of the site. The unit was subsequently expanded 1 m to the north in an attempt to recover artifactual material associated with the hearth. The trench was excavated in two levels to the top depth of the hearth at 5 cm below ground surface. Hearth fill was 14 cm deep; it consisted of unconsolidated 7.5 YR dark brown (value and chroma notations are unavailable) ash stained sand with occasional charcoal fleck inclusions (Figure 6.1). Some root, insect, and rodent disturbance was noted. Two lithics were recovered: one was a siltstone core flake with a collapsed platform and no cortex, and the other was a siltstone flake fragment with no cortex or platform.

The hearth designated Feature 1 was simple and unlined, 45 cm in diameter and 14 cm in depth (Figures 6.2 and 6.3). Fill consisted of 10YR black charcoal and charcoal stained sand. Some rodent disturbance was noted. One macrobotanical sample was collected and submitted to Castetter Ethnobotanical Laboratory for analysis. It produced unburned seeds of carpetweed, purslane, and dropseed, probably unrelated to prehistoric activity (see Appendix D). Mollie S. Toll of Castetter also separated C-14 samples into C-3/C-4 plants. This charcoal from Level 1 was all identified as mesquite. The unusual dominance of mesquite charcoal supports the interpretation of this site as a short-term encampment. Three C-14 samples were analyzed by the University of Texas Radiocarbon Laboratory; results are presented in Table 6.2. The three dates averaged 1077 \pm 123 B.P. (see discussion below).

Table 6.2 LA 54388 C-14 Dates, WIPP Assessment Study, ACOE, 1986.

| Univ. of Texas-Austin Lab. No. | Provenience | Uncorrected Date B.P. |
|--------------------------------------|--------------------|--------------------------|
| 5543 | Feature 1, Level 1 | 1030 \pm 70 |
| 5544 | Feature 1, Level 1 | 1160 \pm 180 |
| 5545 | Feature 1, Level 1 | 1040 \pm 120 |
| 5546 | Feature 2, Level 2 | 1140 \pm 100 |
| 5547 | Feature 2, Level 2 | 1210 \pm 130 |
| 5548 | Feature 2, Level 3 | 950 \pm 90 |

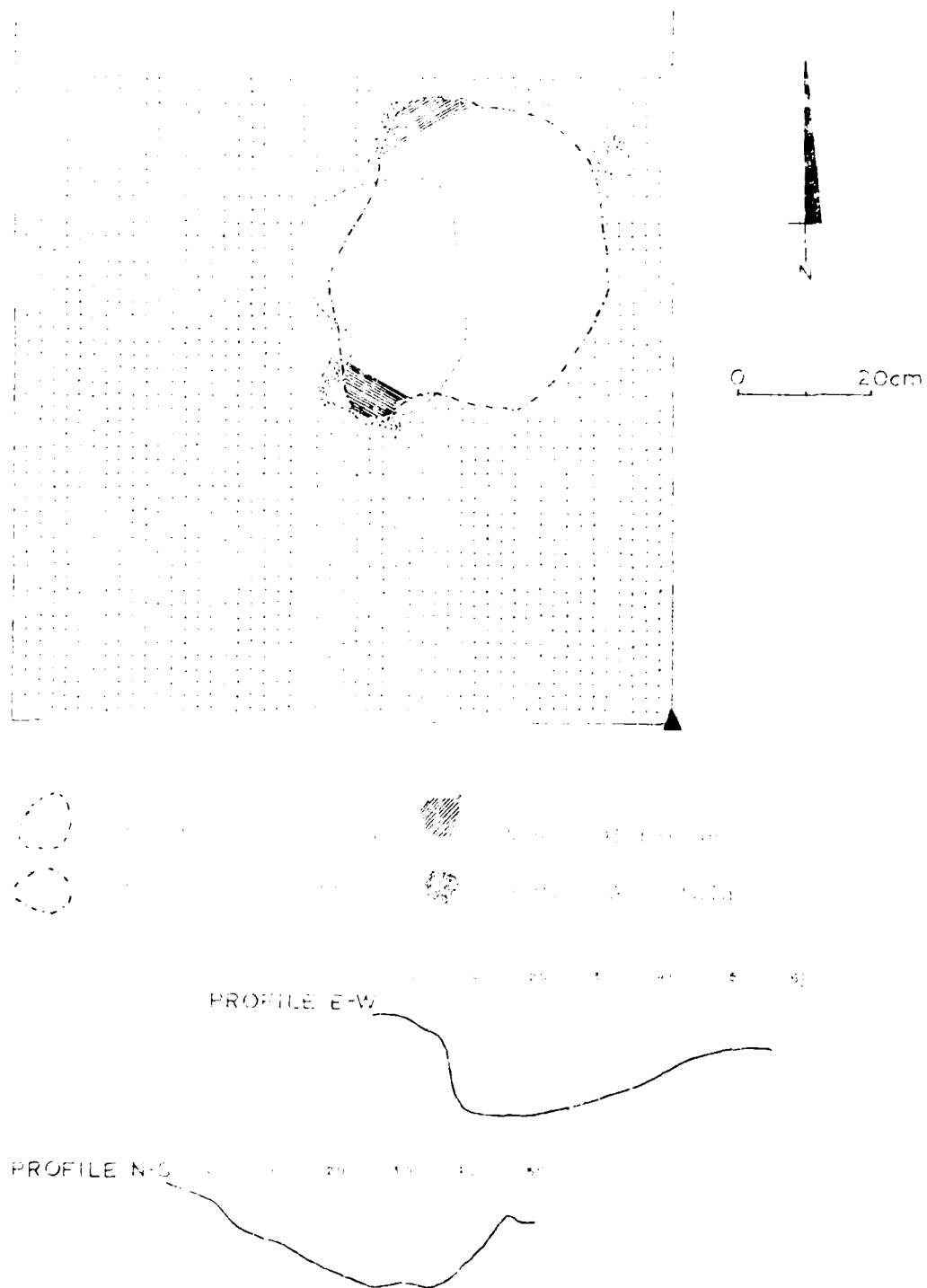


Figure 6.1 Plan and Profile of Eearth Feature 1, LA 54388, WIPP Assessment Study, ACOE, 1986.

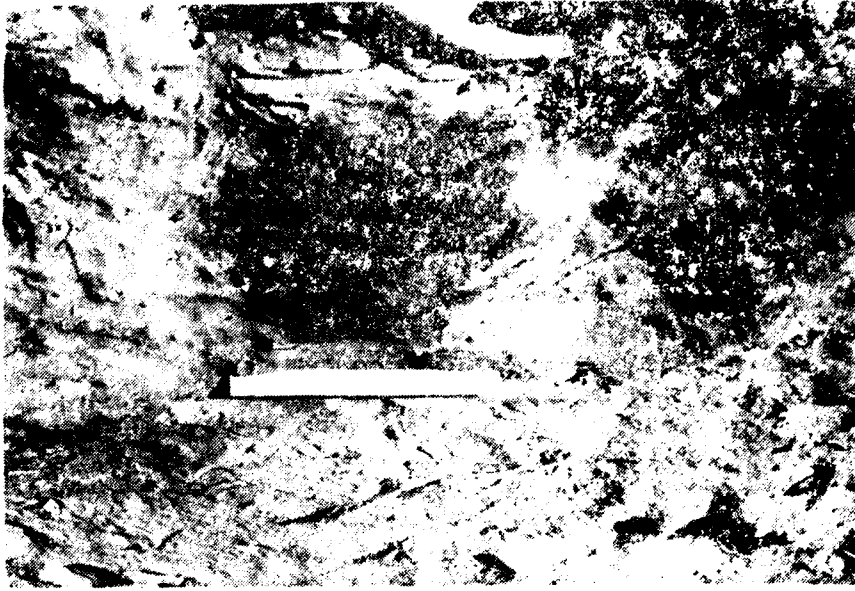


Figure 6.2 Feature 1 Before Excavation, LA 54288 (photo), WIPP Assessment Study, ACOE, 1986.

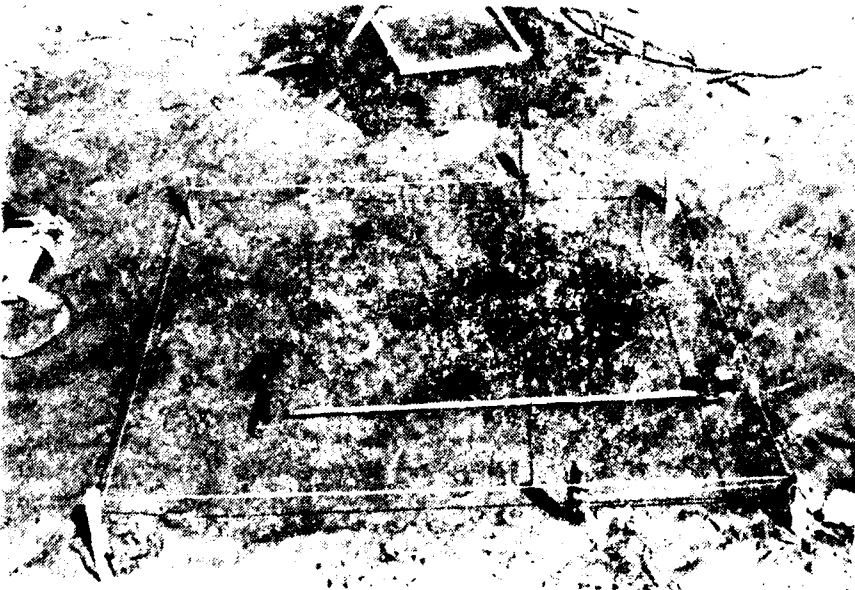


Figure 6.3 Test Pit 1 After Excavation, LA 54388 (photo), WIPP Assessment Study, ACOE, 1986.

Three 1 m units designated test pits 2, 3 and 4 were excavated in an L-shaped configuration around Hearth Feature 2. This hearth stain was visible on the surface of the eastern slope of a semistable dune pediment which demarcated the western edge of visible surface scatter at the site. In an attempt to profile the hearth edge, Test Pit 2 was placed immediately east of the exposed stain. The pit was excavated in a single level to a maximum depth of 25 cm below ground surface. The top 2-3 cm consisted of an unconsolidated 10YR yellow brown blowsand underlain by a loosely consolidated, homogeneous unstructural sand containing charcoal stains in the southwest corner of the pit. No artifacts were recovered; two C-14 samples averaged 1175 ± 115 .

Placed immediately west of Test Pit 2, Test Pit 3 was designed to expose hearth feature 2 in plan view. The pit was excavated in a single level to the hearth's maximum depth at 32 cm below ground surface. Fill consisted of a 10YR dark brown unstructured sand exhibiting extensive rodent disturbance (Figure 6.4). Ash staining was evident throughout the level. The hearth was so ill-defined that its extent could not be measured accurately. A single potsherd and C-14 sample were collected; both appear to have been associated with the hearth. The potsherd was a heavily eroded, undifferentiated brownware. The C-14 sample dated 950 ± 90 B.P.

Test Pit 4 was placed in the dune pediment immediately south of Test Pit 3. The purposes of the pit were to determine whether or not intact cultural deposits continued underneath the dune sand and to recover artifactual materials which could be associated with hearth feature 2. Excavated in three levels to a maximum depth of 50 cm below ground surface, fill consisted of lightly stained, homogeneous, unstructured sand (Figure 6.5). A large, lightly burned caliche manopert was encountered at approximately the same level as the hearth; it probably served as site furniture of some sort. No other cultural material was encountered.

Feature 2, located in test pits 2 and 3, was a simple, unlined hearth approximately 20 cm below ground surface. The hearth was heavily disturbed; wind action and rodent and insect borrows obscured the outline. Probable diameter was 30 cm; depth was 6 cm. Fill consisted of 10YR black charcoal and charcoal stained sand. No artifacts were recovered within the feature. Macrobotanical samples from this feature produced 204 burned seeds from an unknown perennial (see Appendix D). All identifiable charcoal from this feature was Prosopis (mesquite). The C-14 dates from this site were consistent. Standard deviations were high because of the small sample sizes. The weighted average of the dates was 1059 ± 45 B.P., producing a weighted, uncorrected mean (Long and Rippetau 1974) of A.D. 891 and a weighted, corrected mean (Ralph et al. 1973) of A.D. 950 (midpoint), with a range of A.D. 900-1000. This date falls within the traditional A.D. 900-1350 range for Jornada brownwares.

A total of eight auger tests was excavated at LA 543-S; six were placed along the western site perimeter, one was placed along the northern margin and one was placed along the southeastern margin. The purpose of the tests was to determine if cultural materials encountered in the dune blowout extended beneath the margin of dune pediments. Depth of auger tests ranged from 17 cm (Figure 6.4).

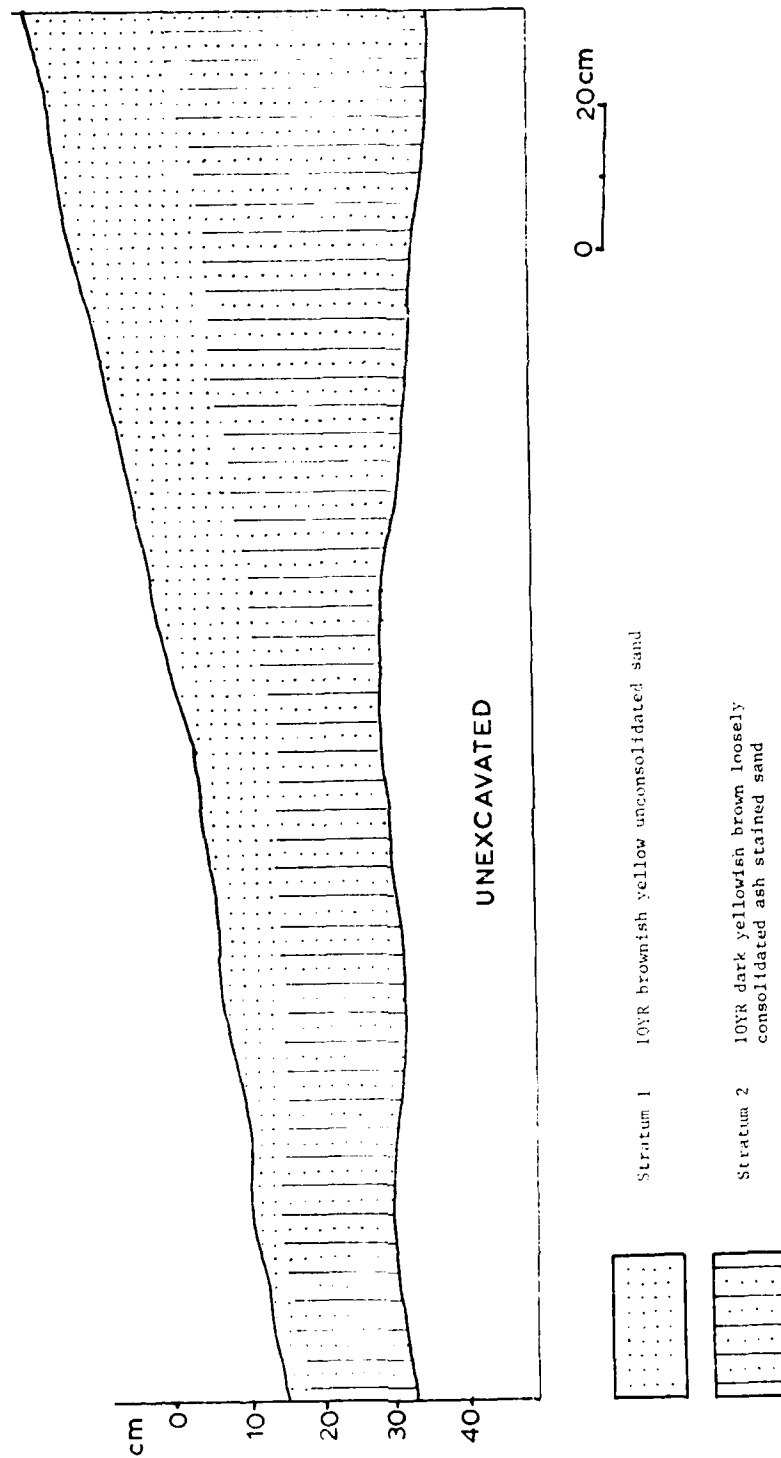


Figure 6.4 South Wall Profile of Test Pit 4, LA 54388, WIPP Assessment Study, ACOE, 1986.

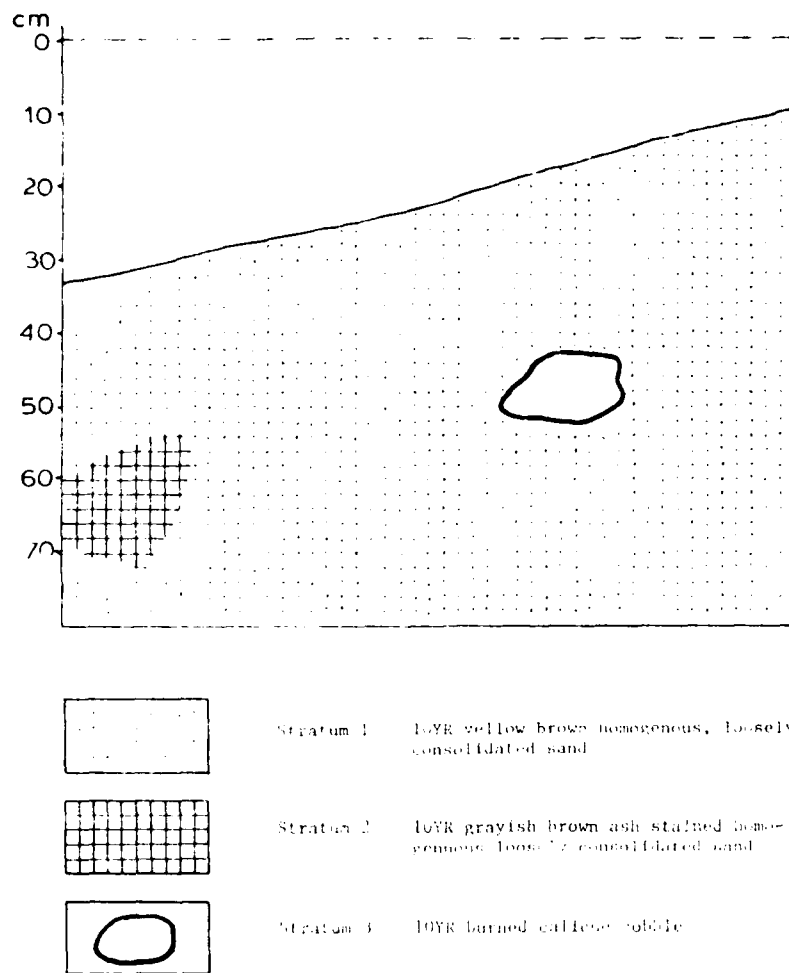


Figure 6.5 East Wall Profile of Test Pit 4, LA 54383, WIPP Assessment Study, ACOE, 1986.

to 150 cm. All tests revealed some evidence of cultural deposition except for one placed along the western margin. Auger Test 1 revealed a subsurface hearth at 17 cm beneath ground surface. Other tests along the western perimeter revealed ash or charcoal, burned bone, and burned caliche at depths ranging from 45 cm to 140 cm. Thicknesses of cultural strata encountered ranged from 19 cm to 23 cm.

6.2.2 LA 54363/MA 235B-7

A total of four 1 m units and 11 auger tests was excavated at LA 54363. Test pits were excavated in Blowout 2 to evaluate possible caliche alignments thought to represent brush or jacal structural remains (Figure 6.6).

Test Pit 1 was placed against a possible caliche cobble stacked drywall segment. The pit was excavated in three natural layers to a maximum depth of 24 cm below ground surface (Figure 6.7). The top 6-8 cm were an unconsolidated 10YR yellow brown blowsand with no charcoal staining. A total of five pieces of debitage was recovered from the level. These included a pink chalcedony proximal core flake fragment with a collapsed platform and no cortex, a quartzite core flake fragment with 100% dorsal cortex and no platform, a siltstone core flake with a single facet platform and no cortex, a piece of chert small angular debris with no cortex, and a piece of siltstone small angular debris with no cortex. None of the debitage exhibited evidence of use.

Underlying the unconsolidated blowsand was an 8 cm thick, 10YR dark brown charcoal stained, loosely consolidated sand with numerous charcoal stained but unburned caliche inclusions. Three pieces of debitage, a bone fragment, and a pink ochre chunk were recovered from the level. Debitage included a pink chalcedony core flake fragment with approximately 10% dorsal cortex, a piece of chert small angular debris with no cortex and a tiny siltstone flake fragment with no cortex or platform. None of the debitage exhibited use wear. The bone fragment appears to be an artiodactyl tooth enamel fragment which was heavily eroded, leached and possibly roasted. The ochre does not appear to have been burned.

The charcoal stained stratum was underlain by a homogeneous 10YR yellowish brown unstained sand situated on caliche bedrock. Three pieces of debitage were recovered; these included a quartzite core flake fragment with no cortex, a tiny brown chalcedony flake fragment with no platform or cortex, and a tiny piece of quartzite angular debris with no cortex. None of the debitage exhibited use wear. No structural evidence was indicated by test excavation (Figures 6.8 - 6.9).

Test Pit 2 was a 1 m x 3 m pit placed across the north-south axis of a possible brush or jacal structure indicated by a rectangular caliche cobble alignment. The trench was excavated in three levels to a maximum depth of 30 cm below ground surface. Level 1 consisted of an unconsolidated 10YR yellowish brown sand with occasional small, stained caliche inclusions. No artifacts were recovered.

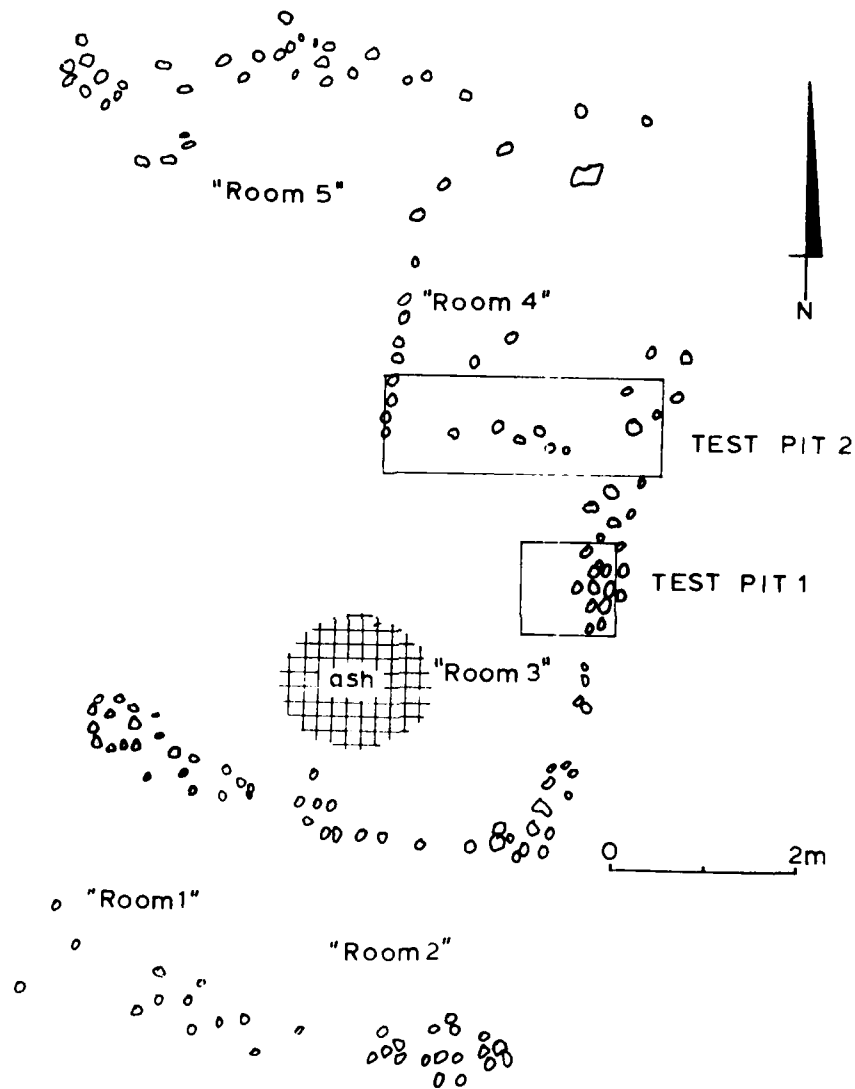


Figure 6.6 Plan of Surface Caliche Alignments, LA 54363, WIPP Assessment Study, ACOE, 1986.

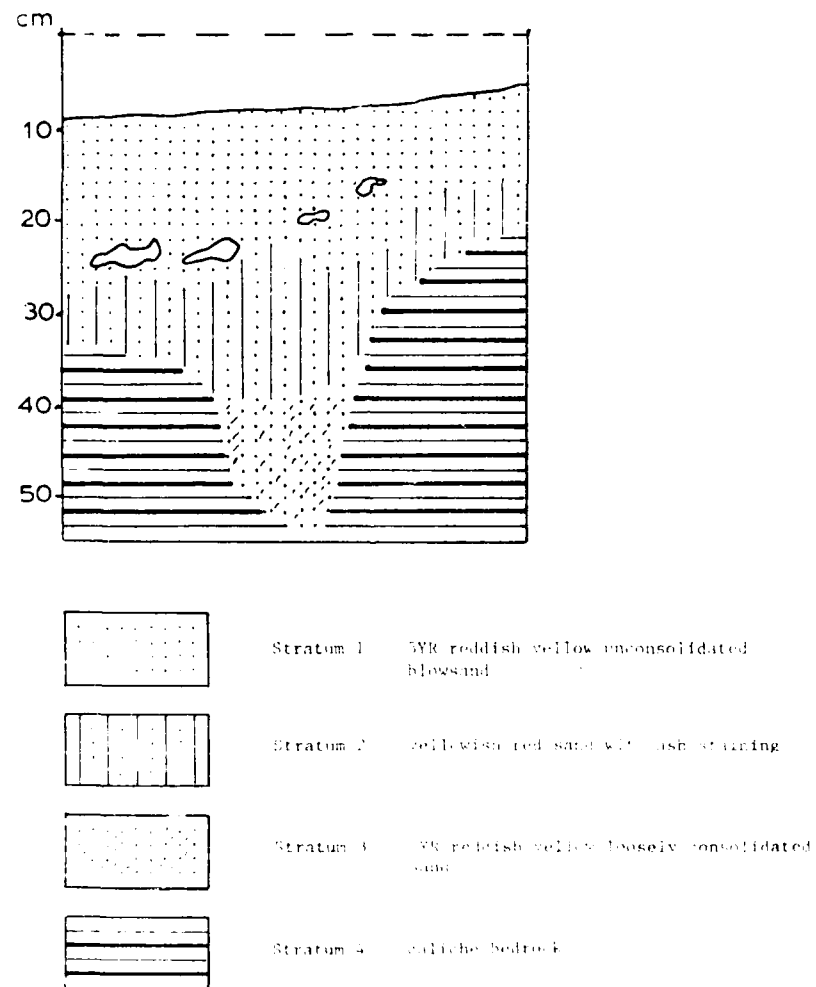


Figure 6.7 North Wall Profile of Test Pit 1, LA 54363, WIPP Assessment Study, ACOE, 1986.

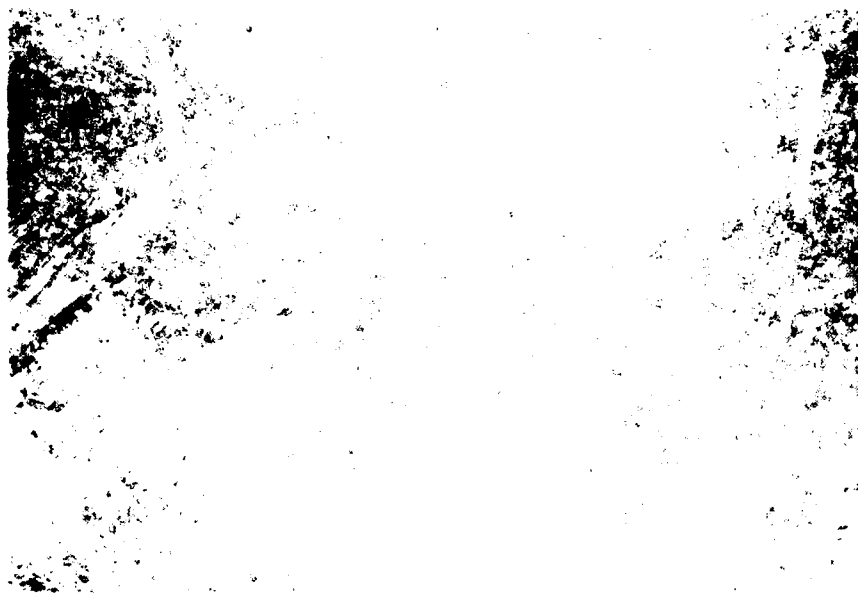


Figure 6.8 Pit in surface of test piece from WIPP Assessment Study, Area 1000.



Figure 6.9 Test Piece 1000 from WIPP Assessment Study, Area 1000.

Blowsand was underlain by a 10YR dark brown ash stained sand; the stained stratum was beneath the suspected caliche rubble alignments exposed on the surface. A total of three pieces of debitage was recovered from the second level. These included a reddish brown chalcedony core flake with a collapsed platform and no cortex, a gray chert core flake midsection with no cortex, and a black chert core flake with a single facet platform and 100% dorsal cortex.

A small C-14 sample was obtained and submitted to the University of Texas Radiocarbon Laboratory. This very small sample produced an unreliable date of 570±520 years B.P., or A.D. 1380±520 (University of Texas-Austin No. 5507).

In the third level, the 10YR yellowish brown sand had no ash content. The level was terminated when caliche bedrock was reached. As the caliche alignment was surficial, the test pit profile was uninformative. Three pieces of debitage and a potsherd were recovered from the level. These included a gray chert core flake with a single facet platform and 80% dorsal cortex, a brown chalcedony core flake with a single facet platform and no cortex, and a brown siltstone biface flake with a retouched platform and no cortex. None of the debitage exhibited use wear. The sherd was Jornada Brown.

Test Trench 2 revealed no evidence to support the contention that the caliche alignments observed were prehistoric structural remains. The caliche alignments appeared to be surficial with ash stained levels underneath. It was concluded that the alignments were probably not the result of brush or jacal structures.

A total of 11 auger tests was excavated along two transects at LA 54363. The first transect connected blowouts 2 and 3 (Figure 6.10); the second connected blowouts 3 and 1 (Figure 6.11). Auger excavations were placed at 10 m intervals along each transect. The purpose of the auger tests was to determine whether or not cultural materials extended beneath the margins of coppice dunes separating the blowouts. The first auger test was placed in Blowout 2 in the vicinity of Test Trench 2. Testing revealed the same stratigraphic sequence revealed in trench excavation. Unconsolidated blowsand was underlain by a dark ash and charcoal stained sand. Caliche bedrock was encountered at 20 cm below ground surface. Five additional tests indicated that the ash and charcoal stained stratum was continuous from Blowout 2 to Blowout 3; the formation of the coppices clearly postdated deposition of cultural materials. The five auger tests excavated between blowouts 3 and 1 revealed the gradual thinning of the charcoal stain and the presence of a sandy clay red paleosol overlying caliche bedrock.

Testing at LA 54363 revealed no evidence of structural remains, but did indicate a massive 8-25 cm thick ash and charcoal stained stratum continuous between two discrete blowouts. Formation processes involved in the deposition of the stratum are not known. Cultural materials were present in the deposit, and caliche inclusions were stained but unaltered. The stratum might be the result of roasting activities. Feature outlines, however, were not defined.

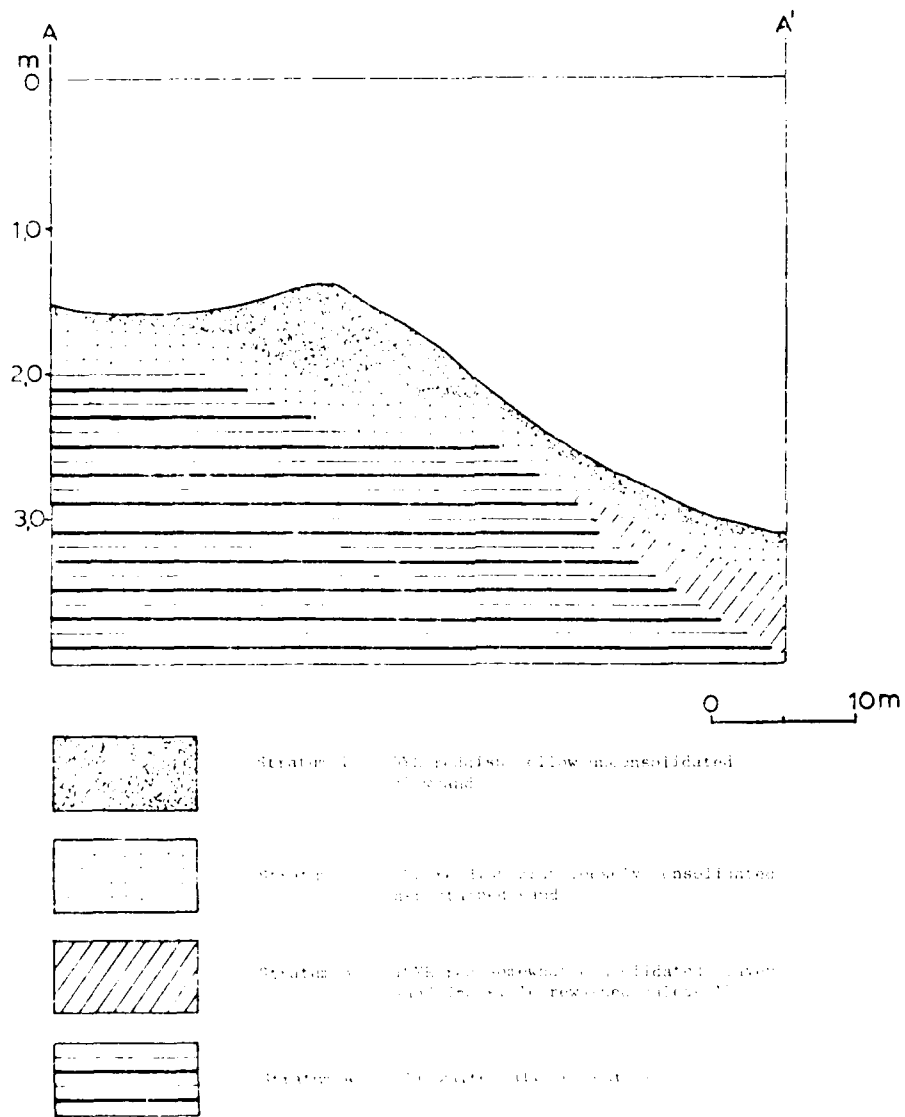


Figure 6.10 Subsurface Cross-sections Based On Auger Test Transect 1, LA 54363

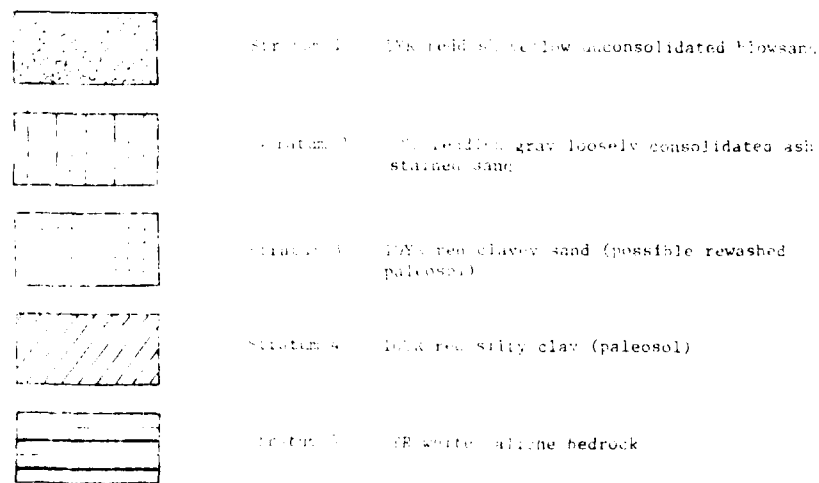
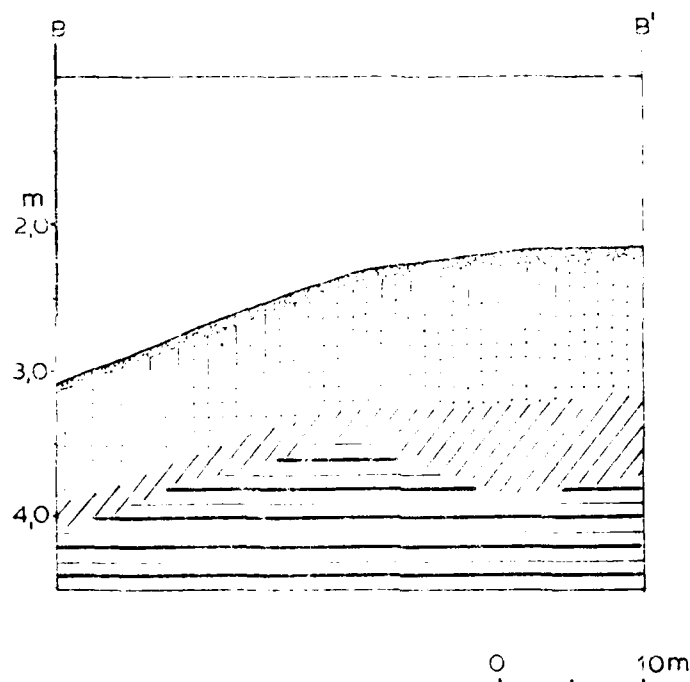


Figure 6.11 Subsurface Cross-sections Based On Auger Test Transect 2, LA 54363, WIPP Assessment Study, ACOR, 1986.

6.2.3 LA 54389/MA 235B-33

A 15 m x 0.5 m test trench and five auger tests were excavated at LA 54389. Tests were designed to determine whether or not lithics and mineralized bone exposed on paleosol at a suspected PaleoIndian site extended beneath the margins of active dunes. The 15 m long trench was excavated along the northern perimeter of the observed scatter in a single level to 5 cm below ground surface. The westernmost 1 m² was excavated in a subsequent level to 30 cm below ground surface. The top 3-5 cm consisted of a 10YR yellowish brown unconsolidated sand. The blow sand was underlain by 2.5YR red mottled sand which was apparently a reworked paleosol. Since the red sand was not in primary context, the test trench profile was uninformative. No artifacts were encountered.

A total of five auger tests was excavated in a transect east of the observed scatter. Depths of the tests ranged from 40 cm to 140 cm below ground surface. Strata encountered included an unconsolidated, subangular sand underlain by a red sandy clay paleosol. Depth of the paleosol ranged from 40 cm to 140 cm. No cultural material was encountered. It was concluded that the site was deflated; no indications of subsurface deposition were present.

6.2.4 LA 54374/MA 235B-18

Nineteen auger tests were excavated at LA 54374, a probable single component early ceramic site contained within a single dune blowout. The purpose of the tests was to determine whether subsurface cultural deposits and datable materials were present. Eight of the tests were excavated in the dune perimeter of the blowout. The remaining eleven were excavated within the blowout. Two stratigraphic units were encountered; these included a loosely consolidated homogeneous 10YR yellowish brown sand underlain by caliche bedrock. Depth of bedrock ranged from 34 cm to 128 cm. Only one test revealed a light charcoal stain. Additional tests in the immediate vicinity indicated that the stain was localized and did not contain datable materials. It was concluded that the site was deflated; subsurface cultural deposits were not indicated.

6.2.5 LA 54364/MA 22B-8

A total of two 1 m test pits and three auger tests was excavated at LA 54364, a suspected single component lithic and ceramic scatter. Test Pit 1 was placed over a pile of burned caliche located near the northern perimeter of the dune blowout to determine whether or not the feature retained datable material. The surface feature consisted of eight pieces of burned caliche in a 35 cm diameter area. The pit was excavated in a single 3 cm thick level. Fill consisted of an unconsolidated, 10YR yellowish brown blow sand. It was determined that the caliche cobbles were resting on red paleosol and that the feature was deflated and retained no chronometric potential. A heavily burned single faceted sandstone mano was the only cultural material recovered.

Test Pit 2 was placed over another concentration of burned caliche cobbles located along the northeastern perimeter of the dune blowout. This

pit was also excavated in hopes of obtaining datable material. Excavated to a maximum depth of 10 cm below ground surface, fill consisted of an unconsolidated 10YR yellowish brown sand. It was once again determined that the burned caliche rested on 2.5YR red paleosol, and that the feature was deflated. The test pit profile, given the lack of depositional context, was uninformative. No cultural materials were recovered. Two of the auger tests were placed in dune areas north of the blowout; a third auger test was placed in a coppice dune in the middle of the blowout. Depths of the tests ranged from 40 cm to 47 cm. Three stratigraphic units were encountered; these included a loose, unconsolidated, 10YR yellowish brown blowsand underlain by a loosely consolidated yellowish brown sand underlain by sandy clay paleosol. No cultural materials were encountered. Test pits and auger tests indicated that the site is probably deflated; chronometric potential was not indicated.

6.2.6 LA 54366/MA 235B-10

A total of 10 auger tests was excavated at LA 54366 which appears to have been a single component lithic scatter. Two of the auger tests were placed in the vicinity of burned caliche features. Excavated to 40 cm and 80 cm below ground surface respectively, neither test revealed subsurface deposition. Paleosol (2.5YR red) was encountered 40 cm below ground surface. Apparently both features were deflated.

The remaining eight auger tests were placed in coppice dunes. Depths of these tests ranged from 80 cm to 190 cm. A total of four stratigraphic units were encountered. Dune surface materials consisted of a loosely consolidated 2.5YR red sand. As depth in the level increased, so did grain size. Charcoal staining in a somewhat compacted reddish sand was encountered in all eight tests.

The thickness of the cultural stratum ranged from 5 cm to 90 cm; the depth below ground surface at which the stratum was encountered ranged from 28 cm to 78 cm. In all cases, the charcoal stained stratum was underlain by 2.5YR red sandy clay paleosol. Tests do indicate that intact cultural deposits may exist in coppice dunes at LA 54366; datable materials may also be present. Areas inside the blowout appear to be deflated.

6.2.7 LA 54375/MA 235B-19

A total of one 1 m² test pit and five auger tests was excavated at LA 54375. Although probably multicomponent, test excavations were restricted to a single blowout containing an ash lens associated with ceramic artifacts. Test Pit 1 was centered directly over an apparent ash lens exposed along the southern perimeter of the blowout. Excavated to a depth of 40 cm, the fill consisted of an organically stained 10YR yellowish brown sand. The pit was terminated when it became evident that the stain was surficial and retained no chronometric potential. The test pit profile was devoid of information content. All five auger tests were placed in the dune near the perimeter of the blowout. Depths of auger tests ranged from 75 cm to 135 cm. Two strata were encountered; the first consisted of a loosely consolidated 10YR yellowish brown sand underlain by caliche bedrock. Some organic staining was encountered in an auger test placed several meters east of the test pit; the

stain either resulted from decomposing food or charcoal. The lens was too ephemeral to retain any chronometric potential.

6.2.8 LA 54385/MA 235B-29

A single 1 m² test pit excavated at LA 54385 was intended to obtain chronometric samples from a hearth stain intruded into 2.5YR red paleosol in a blowout near the center of a possible Paleoindian site. Only the hearth feature was excavated; it was a simple unlined hearth with a maximum diameter of 53 cm and a maximum depth of 7 cm. The shallow nature of the feature and the lack of pit contents made the test pit profile uninformative. Fill consisted of a 5 YR black sandy clay. No artifacts were recovered. The charcoal sample was too small to submit for radiocarbon dating. A sparse flotation sample produced 10 spurge and 15 arrowweed unburned seeds (Appendix B), probably unrelated to prehistoric activity, particularly when the recent arrow on the north side of the feature is considered.

6.2.9 LA 54368/MA 235B-12

A single 1 m² test pit excavated at LA 54368 was designed to obtain chronometric samples from a burned caliche concentration designated Feature 1. Although the site appears to consist of several components, a date for a prehistoric feature type was considered important. Excavated in a single meter to a maximum of 11 cm below ground surface, pit fill consisted of a 1 cm thick lens of charcoal stained sand underlain by 10YR yellowish brown sand. Burned caliche inclusions were restricted to the upper 3-4 cm. The presence of only a very thin stain and burned caliche inclusions at the surface was reflected in a test pit profile lacking information content. A single burned single facet sandstone mano fragment was the only artifact recovered. Because the feature was substantially deflated, no chronometric samples were collected.

6.2.10 LA 54373/MA 235B-17

A total of three auger tests was excavated at LA 54366 for the purpose of locating intact cultural deposition or datable materials. Depth of auger tests ranged from 62 cm to 120 cm below ground surface. Two stratigraphic units were encountered; the first consists of a loosely consolidated 10YR grayish brown loamy sand underlain by caliche bedrock. One of the tests located several pieces of charcoal in the upper 15 cm; no other cultural material was encountered.

6.2.11 LA 54380/MA 235B-24

A total of two auger tests was excavated at LA 54380 which was considered to be a possible single occupation site. The purpose of the auger tests was once again to locate subsurface cultural deposition or datable materials. Depths of the tests were 190 cm and 135 cm. Two stratigraphic units were encountered; these included a 10YR yellowish brown sand overlying 2.5YR red sandy clay paleosol. No cultural deposition was encountered.

6.3 TESTING SUMMARY

The testing phase of the WIPP Project met with limited success. Six radiocarbon samples produced reliable dates; these were all from one site (LA 54388). Thus, an initial step toward correlating absolute dates with temporally sensitive artifacts has been made.

Excavations at LA 54388 proved to be particularly valuable; testing revealed intact cultural deposition, and chronometric samples were obtained at this probable single component brownware site. Absolute dates so derived indicate definite shortterm occupation during the A.D. 900s and provide a chronometric basis for dating Jornada Brown sherds in the project area. These dates provide initial dates for establishing points of reference for the local chronology.

Other successes were less dramatic. Although test excavations at LA 54363 did not reveal structural evidence, stratigraphic data collected did suggest intact cultural deposits in a continuous layer extending beneath dune coppices. The radiocarbon date from this multioccupation site was unreliable because of small size. Interpretation of the activities resulting in deposition of a 15-20 cm thick charcoal stain spanning 50 m (or probably much more distance) is problematic but provocative. A preliminary conclusion might be that larger sites encountered during survey do retain chronometric potential. However, the significance of datable materials collected at large sites remains open to question in the light of contextual interpretability. In other words, diagnostic artifacts often cannot be confidently associated with chronometric samples obtained due to the complexity of occupational events conditioning deposition.

Some evidence of cultural deposition in the form of ash lenses or charcoal was recovered from auger tests at several small sites including LA 54366, LA 54373, LA 54374, and LA 54375. The extent of subsurface deposits or their potential for yielding chronometric samples is not known. The radiocarbon sample recovered from LA 54385, a possible PaleoIndian site was too small to be dated. Several other possible single component tested sites yielded no evidence of cultural deposition. These include LA 54389, LA 54364, LA 54368, and LA 54380. It must be underscored that the testing program was inadequate to determine that any site investigated retained no intact cultural deposits. Cultural deposits were simply not encountered.

The paucity of datable samples recovered from the WIPP testing program emphasize the importance of chronometric samples. In a depositional environment unfavorable for in situ charcoal retention, any intact chronometric sample is potentially very significant for refining the local chronology.

7.0 ARCHAEOLOGICAL INTERVIEWS

7.1 INTRODUCTION

The five archaeological interviews conducted with local amateurs and professionals in conjunction with the WIPP Project are summarized in the following section. Interviews were conducted with Mr. Harvey Hicks, Dr. Charles Crooks, and Mr. Tom Lewis; these men are or were collectors. Mr. Lee Hubbard, curator of the Carlsbad Municipal Museum, was interviewed as was Ms. Linda Brett, Carlsbad Area Archaeologist for the Bureau of Land Management (BLM). Interviews were conducted by Mr. John Acklen who was generally assisted by Ms. Brett.

The interviews and collections were very informative. All individuals contacted were helpful, interested, and intimately familiar with the local archaeology. The collections observed and documented added substantially to information collected during survey and testing phases of the project. One collection was particularly helpful. Mr. Hicks has provenienced every artifact in his collection as to site; he has recorded most of the sites on BLM forms and plotted each on maps. The data potential inherent in his extensive collection is formidable; it was in no way exhausted during the course of a four hour interview.

The summary discussion consists of four parts. The first section includes a consideration of changes in the physical environment as described by informants. In the second section, the artifacts observed in collections are discussed. In the third section, informant descriptions of site characteristics are considered. Finally, the results of the interviews are summarized.

7.2 FACTORS AFFECTING THE CHANGING VISIBILITY AND INTEGRITY OF ARCHAEOLOGICAL RESOURCES IN THE WIPP PROJECT VICINITY

Informant data suggest that archaeological resources in the WIPP vicinity should not be viewed statically; rather, several important factors have contributed to significant changes in resource visibility and integrity during the last century. Two primary factors conditioning changes include the effects of overgrazing on site visibility and integrity and the activities of amateur collectors.

7.2.1 Environmental Changes

Dramatic changes in the vegetation of the area and the resulting effects upon archaeological sites were mentioned several times by informants. In contrast to the patchy distribution of annuals in the vicinity today, informants suggest that vegetation was once characterized by dense matted grasses which were waist high or higher in some areas. As ranching became a dominant subsistence pursuit early in the century, overgrazing resulted and vegetation was increasingly denuded. There were fewer plants to retain groundwater, and rates of runoff increased. As a result, the water table dropped and soil became increasingly subject to erosion. These factors

resulted in erosion of some land surfaces, leading to increased visibility of many archaeological sites. Active dune formation as a result of soil movement may also have resulted in burial of other sites.

Whereas increased visibility and erosion of archaeological sites in this century may be a trend, it is by no means the only factor involved. Climatic factors also appear to have had a pronounced effect on resource visibility. Dr. Crooks began collection during the 1950s during a drought. His favorite area was in the Guadalupe foothills where numerous sites were exposed. When Dr. Crooks returned to the same area in the 1970s, he was unable to locate any sites at all. He suspects that an increase in effective moisture and vegetation after a drought in the 1950s was responsible for soil formation and that the sites are now buried. A shift from grasses to shrubs may also have been involved. Fluctuations in climate or land use practice can apparently have significant effects on site formation processes in the WIPP Project vicinity. These fluctuations have apparently alternately exposed and buried archaeological resources. The implications for interpretation of settlement patterns are significant.

7.2.2 Changing Activities of Amateur Collectors

Changes in amateur collection of artifacts over the last 100 years involve increasing collection intensity as population density has risen, a related depletion of time diagnostic artifacts from exposed surfaces, and changes in artifact types collected. The early decades of the twentieth century produced extensive collections from private ranches. The development of the mining and oil and gas industries in the 1920s and 1930s led to a higher incidence of collection, which collectors report has reduced the proportion of projectile point on site surfaces. Informants indicate that site surfaces today do not reflect site contents present before intensive modern-day collection.

Informants suggested that the earliest ranchers were not generally interested in prehistoric remains or that they were so involved in making a living that they did not notice sites. One account suggested that projectile points were so common in the area in the early part of the century that they were not regarded as interesting or worthy of the attention required to collect them. One of the most impressive collections dating from the early 1900s is the Mr. and Mrs. Dewey Holloveke collection now resident in the Carlsbad Municipal Museum. The Hollovekes collected prehistoric projectile points and tools from sites located in and around their 161 km (100 mi) Delaware River ranch over a period of time spanning at least 65 years. Another early collection mentioned was the James collection, which consisted largely of projectile points and tools collected on the James Ranch, part of the project area. This fine collection was donated to the local museum, but was later stolen.

Collection apparently became a common activity as the oil and gas and potash industries began to develop in the 1920s and 1930s. Workers in both industries commonly lived in camps. Isolated from the mainstream social activities of the day, workers adopted artifact collection as a popular past time. The development of oil and gas industries in particular had another

profound effect on archaeological resources in the area; that is, the construction of mile after mile of well pad and pipeline dirt roads provided easy access to areas which were previously inaccessible. Site distance from roads and its effect on assemblage composition are discussed in the lithic summary in Section 5.4. Unfortunately, few of the collections from this time period are known today.

Informants all agreed that point and tool collecting today is not as productive as it was in the past. Of the three collectors interviewed, two no longer collect. Points have become very scarce, making collecting hardly worth their time. The collectors agreed that in the early 1960s, one could still find 12 to 13 points a day on sites considered to be picked over. Two of the amateurs have collected extensively in Mexico, where site integrity is more intact. Informants suggest there are still areas in the Chihuahuan desert where points are more common than debitage. Mr. Hicks and Dr. Crooks agreed that it was still possible to collect 12 or more points in one hour in some areas. Mr. Hicks tells of a family that collected 12,000 points around a lake on their ranch within a year. They sold the points for a peso a piece and in this way made a payment on their ranch. Informants agreed that certain areas in southeastern New Mexico and southwest Texas were once similar. What we see on sites today, particularly those accessible by road, may not reflect assemblages originally deposited.

Another fascinating observation mentioned several times was the differential nature of artifacts collected through time. Mr. Hicks and Dr. Crooks both stated that the earliest collections contained the largest projectiles. After large projectiles became rare, smaller points and sherds became the preferred collectibles. Later groundstone and other tool types were also collected. Today some collectors pick up debitage as well.

7.3 THE COLLECTIONS

Several classes of artifacts were observed in museum and private collections. These include, minimally, projectile points, ceramics, formal chipped tools and groundstone. The overwhelming majority of artifacts observed were projectiles, and discussion will center upon that artifact type.

7.3.1 Projectile Point Typology

As stated in the research design (Section 3.1.3), a locally based projectile point typology does not exist for southeastern New Mexico. All chronologies currently in use are extrapolated from other areas. Most assigned dates are poorly substantiated; some are admittedly nothing more than educated guesses. Chronological arguments based on observations made on privately collected projectiles from the project area are probably not warranted. In the absence of a valid chronological typology, types observed in the private collections will be related to technological types described in the Oshara sequence (Irwin-Williams 1973) and Texas and Oklahoma types wherever possible.

PaleoIndian types are generally understood to be spear points. The earliest types, the Llano tradition materials which include Clovis and some

examples of the Plainview type, are thought to precede Folsom/Midland materials; these are followed by Plano types. All these types are lanceolate shaped points. Craftsmanship is superior. Early Archaic points are similar morphologically in that they are lanceolate; however, workmanship is extremely crude in comparison to earlier PaleoIndian materials. Early Archaic point size indicates that they may have been spear points, but basal morphology, i.e., lack of thinning and careful grinding, suggests the use of a different hafting technique.

The transition from Early to Middle Archaic may reflect the change from a spear to atlatl dart technology. In the Middle Archaic, points are smaller in size and tend to be stemmed; stems are shorter relative to width. Hafts tend to be more complex. In the Oshara sequence, San Jose points are the hallmark of the Middle Archaic.

Late Archaic points are typically palmate; stems change to corner notches. Stems may either be long or short. In the Early Ceramic period, palmate shape and corner notching are maintained. However, the size of points is drastically reduced; this apparently reflects the transition from dart to bow and arrow technology.

In the Late Ceramic period, corner notches are superseded by side notches. In the protohistoric period, side notched points may have been replaced by triangular types with a single basal notch.

7.3.2 Locally Collected Point Types

7.3.2.1 PaleoIndian

Although relatively rare in comparison to late Archaic and ceramic point types, a complete range of PaleoIndian types was observed in the local collections. Notable was the presence of a possible Sandia point, a complete Clovis point and several Plainview points resembling unfluted Clovis (Figure 7.1). Much more common were Folsom and Midland types. Several examples of Meserve points were noted; these appeared to be resharpened. Many of the PaleoIndian points observed were manufactured of a dark grey chalcedonic chert which was apparently a preferred material. Collectors stated that none of the points were picked up on unambiguous PaleoIndian sites in the area and that later point types were picked up on the same sites.

7.3.2.2 Archaic

Archaic materials in southeastern New Mexico have been compared to those in the El Paso, southwestern and northwestern New Mexico, Trans-Pecos Texas, Edwards Plateau, and northern Mexico (Coahuila) regions. The occurrence of projectile points in the WIPP area that are similar to those in so many other areas may suggest similar Archaic adaptive strategies in these areas (O'Laughlin 1980:24). While forthcoming studies of the Chihuahuan Desert Archaic define it as an entity separate from, although related to, other southwestern culture histories (Regge Wiseman, 1987 personal communication).



Figure 7.1 PaleolIndian Points from the Crooks Collection (photo), WIPP Assessment Study, ACOE, 1986.

this report makes reference to the presently available literature from New Mexico, Texas, and Oklahoma.

Early Archaic points were very rare in the collections observed, even in comparison to PaleoIndian. Local typologies may be so poorly understood that points dating from this time period went unrecognized. It could also be true that Early Archaic occupation of the area was sparse. Whatever the case, it is quite clear that, as in other areas, Early Archaic settlement and subsistence in the WIPP vicinity are poorly documented.

Middle Archaic points were also poorly represented in the collections observed. Several San Jose like-points were observed in the museum collections and in the Hicks and Crooks collections, but they were not common. Some of the very large corner notched points observed may in fact date to the Middle Archaic time period.

Once again the reasons for their apparent rarity may reflect the lack of accurate chronologies or the lack of intensive occupation of the area. Another possibility is that the typological sequence proposed in the Oshara chronology is not applicable to the southeastern New Mexico area.

In contrast to Early and Middle Archaic materials, Late Archaic forms are common indeed (Figure 7.2). Forms thought to be Late Archaic are characteristically palmate with corner notches and convex or straight bases. Late Archaic points observed are similar to the Basketmaker II points in the Oshara Tradition or to the Marcos, Marshall, Edgewood, Ellis and Shumla points in the Texas sequence. Carlsbad points may also be associated with the Late Archaic in the area. Points representing all types mentioned were present in the local collections.

7.3.2.3 Ceramic

Points thought to date to Early Ceramic times were also very common in collections. Although much smaller in size than the points thought to date to Late Archaic times, they are quite similar in morphology (Figure 7.2). Points which could be typed as Alba, Bonham, Deadmans, Livermore, and Scallorn were observed in the collections.

Late Ceramic period points, while well represented, were not as common as Early Ceramic points in the collections. Points observed which could be classed as Late Ceramic include Reed, Toyah, Harrell and Garza points. One unambiguous protohistoric point, a lanceolate stemmed projectile made of metal was observed in the Hicks collection. Mr. Hicks suggested that it was a French steel variety; it was found along with an Army button on a multicomponent site.

One other projectile point which was quite common in the collections has unknown temporal associations, but is thought to date to the A.D. 900s-1000s. Matjamar points were present in every collection observed. This irregularly shaped notched point has a limited distribution outside the Carlsbad vicinity. It is distinguished by a leaf shape and is always serrated. Notches, when

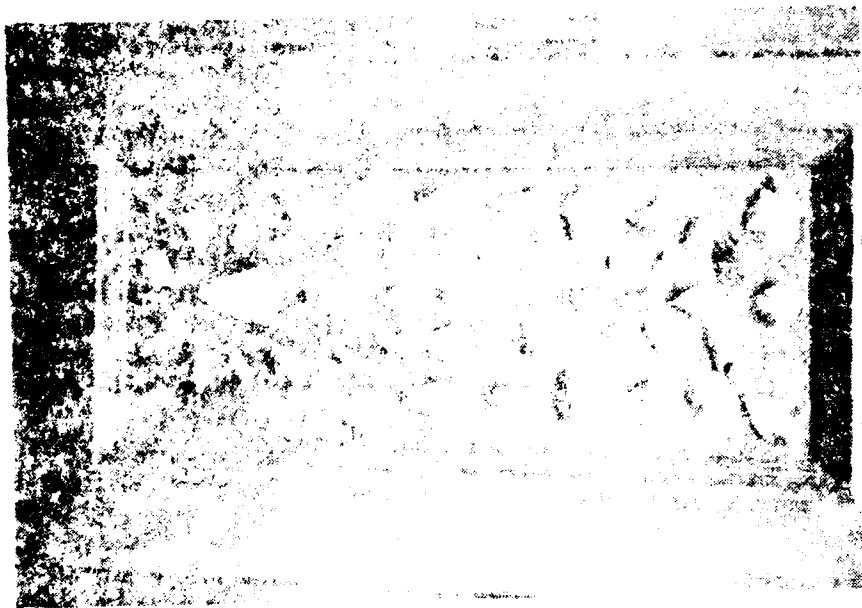


Figure 7.2 Points collected from a collection, Post Collected from the
Carroll County, Virginia, Assembly Study, ACOE, 1986.

present, occur on the sides. The shape and blade edges are extremely variable (Leslie 1978:110-112).

7.3.3 Ceramic Artifacts

Ceramic artifacts were quite common in comparison to projectiles in the collections observed. Ceramics were collected from multicomponent sites. Types observed included Rio Grande glazes, Mimbres Black-on-white, Chupadero Black-on-white, Lincoln Black-on-red, Three Rivers Red-on-terracotta, Jornada brown, Jornada Corrugated, and Three Rivers Red Incised. Ceramic types span the Early and Late Ceramic periods. The type sites for some of these types are as distant as the Yuhavi, Moxilion, Gran Quivira, and Casas Grandes areas.

7.3.4 Other Chipped stone

A number of knives, biface scrapers, and occasional graters and burins were present in the composite collections. Quality of material and workmanship were variable. The variability of tool types observed in collections was far greater than variability observed on archaeological sites in the field. Although based on biased collection, this pattern does indicate that surface assemblages visible today do not reflect original site contents.

7.3.5 Groundstone

Groundstone was well represented in the Hicks collection; it was also observed in the museum. According to Mr. Hicks, metates were commonly found inverted over manos. This pattern suggests that metates and manos were kept as furniture at sites which were repeatedly reoccupied, probably on a seasonal basis. Other groundstone artifacts observed were a comal and pestle. The pestle came from Ash Draw.

7.3.6 Possible Hoes

Another tool type present in the Hicks collection consisted of several bipointed, biconvex chipped flint artifacts. These artifacts were as large as 50 cm. by 30 cm; according to Mr. Hicks, all were collected in dune areas, some as isolated occurrences. Morphologically, these artifacts resemble hoes, a classification supported by Mr. Hicks and Dr. Crooks. The practice of agriculture or horticulture in southeastern New Mexico could be confirmed by association of agricultural products with these hoe-like implements. While no cultigens have been identified from southeastern New Mexico sites east of the Pecos River, this pattern could relate to excavation prior to institution of modern flotation procedures. These artifacts could be mesquite firewood root "grabbers" (Kenjo Wiseman, 1987 personal communication).

7.4 SITE CHARACTERISTICS

Another informative aspect of archaeological interviews was the way in which local collectors locate sites. Mr. Hicks examines a map and searches near water sources. The largest sites in the area are generally located on

the southwest side of available water, according to collectors. Mr. Hicks attributes this pattern to placement of the camp upwind of water, keeping it relatively free of insects.

The large camps are frequently multicomponent containing the entire range of projectile points. This factor may contribute to difficulty in defining a local chronology. This problem is addressed in the research design (Chapter 3).

7.5 CONCLUSIONS

Interview data suggest that artifactual assemblages visible on stable land surfaces in the Carlsbad area have fewer artifacts than were originally present. Within this century, frequent collection has severely altered assemblage characteristics. Projectile points have suffered particularly from collection. The range of collected artifacts types apparently broadens to include smaller and smaller items. Additional major effects are changes in climate and land use which have resulted in a general pattern of increasing potential instability of archaeological deposits. Overgrazing and fluctuations in climate may result in erosion, burial and reburial of deposits.

Point frequencies suggest extensive use of the local area in Late Archaic and Ceramic periods, although more recent sites are probably also more visible than PaleoIndian and Early Archaic sites. PaleoIndian points are generally quite rare as are Early Archaic points in the area. Late Archaic points are quite common by comparison as are Early and Late Ceramic period points. Early Ceramic period types appear to be more common than later types.

Other artifact types including ceramics, bifaces, and burins, were not nearly so well represented in collections observed as were the projectiles. Of particular interest were hoe-like objects of limestone which could reflect horticultural activities.

Finally, collectors reported that large sites frequently occur on the southwestern margin of water sources. These large sites are almost invariably multicomponent, indicating the importance of water sources in settlement location. The multicomponentency is, unfortunately, reflected in a poorly developed local chronology.

8.0 LAND USE IN THE CARLSBAD AREA [AD 1582 to 1945]

8.1 INTRODUCTION

The course of economic adaptive patterns and human habitation in southeastern New Mexico was shaped by the environment and human interaction. While providing a general historical overview, I have focused on specific descriptions of the peoples inhabiting the region and how they used the land (Table 8.1). The Apaches dominated the Pecos River from the Seven Rivers Valley to the Black River south of Carlsbad and extended onto the plains around the WIPP site from at least 1580 to 1880. They were replaced temporarily by the Comanche and permanently by the Americans. A discussion of the environment, Indian population, and adaptive strategies first encountered by the Spanish in and surrounding the region sets the context for later events. This background information is based on Spanish entrada accounts and is necessarily limited, but it provides a basis for comparison. For the early period, considerable ambiguity is involved in correlating names given to Indian groups with names in use in the seventeenth and eighteenth centuries. Similarly, correlating names for landmarks such as Los Medanos with currently used similar names is of doubtful validity except for the most prominent landmarks. Also, large rancherias encountered by one expedition are not necessarily the same settlements as those encountered in the same area by later expeditions. Finally, the routes of various Spanish expeditions are known only in general, so that exact locations cannot be determined.

The study essentially focuses on how the region was dominated by two groups, the Apaches and the Americans. Discussion involves an examination of the influx of new populations, the introduction of European technology and group interactions which affected the adaptive strategies of the established population.

The first section concentrates on the Apaches and examines the adaptive strategies used at contact and how they evolved through time as a result of changes around them. Groups do not live in isolation, they are affected by the peoples around them. Trade and warfare constitute the most common kinds of interactions between peoples. Apache relations with the Spaniards, Pueblos, Mexicans, Comanches, Caddoans, and finally the Americans shaped their adaptive decisions. Group interaction determined available resource options in terms of their territorial range, means of subsistence and level of technology used to exploit and defend these resources. The research technique concentrated on using primary historical documents and eyewitness accounts to reconstruct Apache adaptations. Reconstruction is in places limited by the availability and quality of historical materials.

Table 8.1 Historical Overview of the Carlsbad Vicinity, WIPP Assessment Study, ACOE, 1986.

I. Spanish Entradas

A. First Entrada Period 1530-1540

1. No direct entry into the project area was involved; the first entradas followed the Rio Grande.
2. Chronicles are important for their description of Jumanos and Sumas around the La Junta and El Paso areas.
3. Alvar Nunez Cabeza de Vaca was the first Spaniard to describe the Plains Jumanos.
4. Coronado's descriptions of the Plains Indians whom he called Querechos and Teyas are extremely useful, providing an account of hunting and food gathering techniques and trade with Pueblos.
5. Entradas were motivated by desire for quick wealth in the form of accumulated Indian treasure or gold and silver mines.

B. Second Entrada Period 1580-1600

1. Rodriguez-Chamuscado Expedition 1580
 - a. Primarily of interest because chronicler Gallegos provided astute ethnographic and environmental observations.
 - b. Descriptions of upper Pecos area and Plains Indians were given.
 - c. Major impact on the project area was that New Mexico was claimed for the King of Spain and called San Felipe del Nuevo Mexico.
2. Antonio de Espejo 1582
 - a. Espejo's was the first entrada to travel down the Pecos River from the north to the south near Roswell.
 - b. Chronicler Luxan provided valuable commentaries on the Jumanos and also indicated that mesquite and prickly pears were growing along the Pecos near the study area.
 - c. The report identifies the Jumanos as a group living between the Pecos River and La Junta.
3. Gaspar Castano de Sosa 1590
 - a. This expedition constituted the first documented exploration of the southern and middle Pecos River basin.
 - b. The account described the Jumanos at Horsehead Crossing.
 - c. The expedition verified the presence of mesquite and abundant game in the middle Pecos region.
 - d. First description of the dog travois was given.
 - e. The report described rancherias near Carlsbad and possibly Major Johnson Spring.
 - f. A new group, the Apaches, were mentioned west of Carlsbad in the Guadalupe Mountains and on the river in an area considered Jumano territory.

Table 8.1 (continued)

- g. De Sosa's expedition reflected a new economic focus of the second entrada period, which was to secure control of tribute and labor from sedentary peoples.
- 4. Don Juan de Onate 1598
 - a. Expedition provided a description of the Querechos, whom he called Vaqueros, 58 years after Coronado's description.
 - b. This extremely valuable report described trade relations between the Pueblos and the Plains Indians as well as trade goods.
 - c. The account indicated the presence of cultural groups other than Vaqueros whom he called Excanxaques and Rayados based on their different habitats, body decoration and language.

C. Entradas' Value to Project Area

- 1. Reports indicates a higher water table and more lush environment in the sixteenth century than at present.
- 2. Accounts described rich food resources, both plants and game.
- 3. Ethnographic accounts of groups who were using the area's resources were provided.
- 4. The Spaniards did not colonize the middle Pecos River; the area was recognized as the province of the Apaches, and except for occasional military forays and trading parties, the Spaniards stayed out of the region.
- 5. Entrada accounts indicated a link between the Tompiro or Humano Pueblos (Gran Quivira) and the Jumanos in La Junta region.
- 6. Interdependent trade relations between the Plains and Pueblos were a key to the area's economic development.

II. Seventeenth Century

A. The Pecos River remained unsettled by Spaniards.

- 1. Throughout this century territory east of the Rio Grande to the Pecos River was claimed by the Faraon Apaches.
- 2. Spaniards had only nominal control, while constant raids on the Spanish ranches and Pueblos were made by the Sandia Apaches and the Apaches of Seven Rivers.
- 3. The Spaniards took over the Pueblo-Plains trade and extended it to Chihuahua along the Camino Real.

B. Humano Pueblos (Gran Quivira)

- 1. Pueblos had well documented trade between Plains Indians and Pueblos.
- 2. Jumanos and Spaniards traveled up and down the Pecos River between 1630 and 1680 from the pueblos to the annual Jumano trade fairs at La Junta and the Caddoan trade fairs on the plains.
- 3. The Spaniards were driven from New Mexico in 1680; the Humano Pueblos were destroyed by Apaches and trade was disrupted.

Table 8.1 (continued)

4. Apaches then blocked southern Jumanó attempts to re-establish trade with Pecos Pueblo and the Spaniards. The Spaniards refused to trade, possibly because they were unable to help the Jumanó in this endeavor.
5. Spaniards were driven from Texas and, when they returned in 1715, they discovered the Jumanós had allied with the Apaches; they were thereafter referred to as the Jumanó Apaches by the Spaniards.

C. Exploitation of Project Area's Resources

1. The project area was widely used for hunting and gathering. The range of the Seven River Apaches must have extended to the sand dunes and the Llano Estacado.
2. The area was possibly used as a trade route or staging area for trade.

III. Eighteenth Century

A. Comanche Pressure

1. Comanches applied for permission to trade at Taos in 1709.
2. Comanches exerted pressure first on the Jicarillas and then the Faraones.
3. The Apaches were caught between the Comanches and the Spaniards.
4. The Spaniards ultimately allied with the Comanches to exert pressure on the Lipan Apaches.
5. Comanches took control of the southern plains between 1750 and 1776.
6. Due to Comanche control and preference for Taos, this pueblo became the major trade fair, and Pecos Pueblo was eclipsed.
7. Intermittent peace and war with the Comanches continued until the Comanche Peace in 1786.

B. San Saba Expedition 1758

1. The Governor of Santa Fe, Tomas Cuchapin, sent Francisco Romero and Jose Miravel along with five Pecos Indians to find a quick route to San Saba Mission.
2. The Governor was unsure where it was located and wanted to know if it fell under his jurisdiction; he also wanted to establish a trade route.
3. The expedition traveled along the Pecos River and encountered Lipan Apaches; while staying with the Lipanes, Comanches attacked and wounded Romero.
4. Eventually Romero and Miravel stayed with some Mescaleros in Los Medanos sand dunes.
 - a. Los Medanos sand dunes are located on the James Ranch which is in the project area.

Table 8.1 (continued)

- b. This location was possibly a well known and often used trade route.

C. Ciboleros (Buffalo Hunters)

1. The Comanche Peace opened up the plains for buffalo hunting which did not increase in scope and importance until 1810.
2. Expeditions were usually mounted by wealthy individuals or entire villages.
3. Soon there were cibolero trails running all along the Pecos River and onto the Llano Estacado.
4. Organized groups came up from Mexico to hunt buffalo.
 - a. They usually stopped at Salt Flats and then continued up the Delaware to the Pecos River, which they followed north to Fort Sumner.
 - b. There were cibolero trails on the east side of the Pecos River near the project area.
5. After 1860, there was constant friction between the Texas cattle ranchers and the ciboleros.
 - a. The ciboleros also fought with the American hunters, who slaughtered entire herds and left them to rot.
 - b. The ciboleros used horses and lances and preferred to run the buffalo, which Americans objected to.
6. The southern buffalo herd was slaughtered between 1876 and 1879.
 - a. This had widespread economic implications for the ciboleros and the Indians.
 - b. Many former ciboleros became Comancheros while the Indians were forced to prey on the ranchers' livestock, which they traded to the Comancheros.

D. Comanchero Trade 1786-1860

1. The Comanche Peace Treaty also opened up the plains to traders.
2. At first, the Comanchero trade was merely an extension of the trade fairs to the plains.
 - a. Trade goods included trade bread, flour, sugar, tobacco, onions, iron arrow spikes and lances.
 - b. These goods were exchanged for horses, buffalo robes, meat and slaves.
3. Over time this role gradually changed; Comancheros began providing guns, ammunition and whiskey in exchange for stolen cattle, mules and slaves.
 - a. Not all Comancheros engaged in this trade, but many Americans were involved.
 - b. The trade began to shift by approximately 1830 as the Comanches and Apaches increased their raids on northern Mexico.

Table 8.1 (continued)

4. New Mexico provided an outlet for the plunder and thus encouraged the raids.
 - a. Anton Chico, Bosque Redondo and Bosque Grande were big trade centers.
 - b. There were numerous trails running along the Pecos and the edge of the mountains to these towns.
5. As the army increased their control the Comancheros began to rendezvous in the mountains and other secluded areas.
6. The trade was not effectively ended until the Comanches and Apaches were placed on reservations.
7. It is a possibility that the Comanchero trade involved the project area.
 - a. El Cuate, a former cibolero turned Comanchero and ultimately a cowhand for Chisum, was clearly in the region.
 - b. It is also possible that La Placita and Missouri Plaza were involved in these economic activities.

IV. American Development of the Area 1848-1900

A. American Presence in New Mexico

1. The Treaty of Guadalupe-Hidalgo was signed in 1848.
 - a. The treaty granted American citizenship to all Mexican citizens residing in the territory.
 - b. The treaty guaranteed property rights.
 - c. The treaty promised protection from the Indians.
 - d. Treaty terms were not honored by Congress.
2. American presence did not affect New Mexico until cattle ranchers started moving in and demanding protection from the Indians; Fort Stanton was established in 1855.

B. Early Settlements in Southeastern New Mexico 1850-1870

1. Mexican-Americans began moving along the eastern slopes of the Guadalupe and Organ mountains.
2. They established small ranchos and villas along the streams emptying into the Pecos, the Rio Bonito and the Rio Hondo.
3. Plaza de San Jose (Missouri Plaza) was established in 1867.
 - a. It was established by Mexican-Americans from Manzano.
 - b. They practiced mixed farming and possibly freighting.
 - c. The town was abandoned when the Hondo was diminished by upstream irrigation.
4. La Placita (Lincoln), Tularosa, Puerto de Luna and San Patricio were established from 1855 to 1873.
 - a. Towns were founded by Mexican-Americans.
 - b. They practiced irrigation farming and herding.
 - c. They moved due to population pressure and possible land seizure.
5. This region was settled because of water supply and presence of the fort.

Table 8.1 (continued)

6. The area around the project was settled later in part due to difficulties with getting the land surveyed and the Apache presence.

C. Development of the Cattle Industry

1. The establishment of army forts and eventual creation of Indian reservations created a market for cattle.
2. Charles Goodnight and Oliver Loving blazed the first cattle trail on the east bank of the Pecos River in 1866.
3. They were followed by John Chisum in 1868, who became the cattle king in the region.
4. The cattlemen, including Chisum and C.B. Eddy, took control of the key springs along the Pecos.
5. Disputes over cattle contracts for the reservations eventually led to the Lincoln County Wars.
6. Overgrazing, drought and declining cattle prices led to the demise of the cattle industry by the late 1880s.

D. Seven Rivers 1870-1898

1. Seven Rivers was not technically a town until the mid 1880s.
 - a. There were scattered ranches in the area.
 - b. It had been known from the seventeenth century as Seven Rivers.
2. The economy was built on the cattle industry; there were a number of blacksmiths, harness makers, bars, etc., indicating a cattle supported economy.
3. As cattle ranching began to decline, Seven River's economy was affected.
 - a. It lost the contract to supply materials to MacMillan Dam; Carlsbad (Eddy) was competing economically as well.
 - b. Finally, when Eddy became the county seat, Seven Rivers became a ghost town.

E. Eddy (Carlsbad)

1. Eddy was founded by C.B. Eddy as a ranch service center and business oriented community.
2. Eddy County was created in 1889.
3. Eddy won the general election, making it the county seat and future urban center.
4. In 1890 the name was changed to Carlsbad in an effort to promote its mineral waters, which were said to be similar to those in Karlsbad, Germany.
5. The development of irrigation and railroads in the area assured Eddy's economic control of the county.

Table 8.1 (continued)

5. The development of irrigation and railroads in the area assured Eddy's economic control of the county.

F. The Development of Irrigation and Land Speculation

1. C.B. Eddy formed the Pecos Valley Land and Ditch Company in 1882.
2. This was the start of a new era of economic development based on irrigation agriculture.
3. A dam was constructed near Avalon Dam in 1888.
4. The Pecos Valley and Ditch Company was reorganized into the Pecos Valley Irrigation and Improvement Company in 1892 under J.J. Hagerman's control.
5. Previous to the reorganization, J.J. Hagerman had invested in the Pecos Valley and Ditch Company and built a railroad link in 1891 to Pecos, Texas; another to Roswell was finished in 1894.
6. A severe market crash in 1893 and a flood which broke Avalon Dam provided additional setbacks; the dams were poorly designed and linked, the climate was adverse and the region was still unable to ship what it did produce to major markets.
7. A major flood in 1903 wiped out the dam, the irrigation canals and the railroad.
 - a. Teddy Roosevelt made a personal inspection of the irrigation dam and canals.
 - b. The federal government acquired the irrigation canals, dams and access lands in 1903 and funded the rebuilding of MacMillan Dam.

V. Twentieth Century Developments

- A. Land continued to be used for cattle grazing and farming.
- B. Mineral exploitation involved potash mines and oil and gas exploration.

The section on 1860 settlement concentrates on the later settlement and development of the region. A determination of Hispano influence on settlement patterns in the Carlsbad-Llano region was a major research objective. Hispano-Mexican settlement history in the area has never been definitively established. Research concentrated on an effort to document hitherto unknown Hispano settlements south of Missouri Plaza. Locations of towns and physiographic features, where known, are specified on Figures 2.1 and 3.1. Evidence of Hispano settlements is simply not documented. An explanation of this void was derived by examining the frontier conditions which shaped Spanish settlement patterns and the cultural constitution of the Mexican population in southeastern New Mexico.

The Spaniards' reliance on native labor and focus on mineral wealth precluded early settlement in southeastern New Mexico. Frontier realities further changed Spanish economic adaptations. Spanish expansion was limited by their inability to control the Apache and a focus on mixed farming and herding rather than ranching. Later settlement was prevented by Anglo expansion where economic and military resources allowed immediate development of the land.

The Hispano-Mexican population in southeastern New Mexico does not resemble Hispanic culture in the rest of New Mexico. Hispanos in the north and southeast refer to their culture as "Little Texas". Oral interviews with Mexican-Americans and census records confirm that the first Spanish-speaking inhabitants in the southeast came from Mexico and Texas. Their culture reflects these regions and not the distinctive culture developed over three centuries in New Mexico.

After the Apaches were effectively removed from the Carlsbad region, Anglos with a different economic focus dominated the area. Ranching was the primary industry on the Llano. The local history of the ranches was constructed using oral interviews. The information from the interviews was verified and augmented where possible by land and voting records, census data, water and grazing records, newspaper accounts, and unpublished materials from local historians. The James and Livingston ranches were the first and only developments in the area surrounding and adjacent to the WIPP Site. Interview questions focused on descriptions of the environment in 1898, whether or not Spanish settlers were present, the amount of Indian material culture picked up or destroyed by local collectors, the presence of other settlers or farming activities, and the quality of life. Because of memory lapses and time telescoping inherent to oral interviews, information was verified where possible. In cases where it was not possible to verify information, such as the Lindsey Lake choza (dugout) and corral, it has been noted.

The history of Mexican-American towns and districts was also based on oral interviews and materials collected by local historians. It was verified where possible with church documents, on site inspections, census and voting material. Many of the towns are no longer extant, but I examined the foundations and graveyards at Look Out, Cuba, and Chili. Land records were not particularly useful as most Mexicans either rented or did not file.

Cibolero impact on Apaches in the Seven Rivers Valley was minimal. By the time the ciboleros began to affect the buffalo herds, the Apaches were already living on mountain resources and conducting raids in Mexico. Cibolero hunting activities had the greatest impact on the Comanche. Ciboleros from Mexico did settle in the Ruidoso-Hondo River valley but their cultural impact was minimal.

Ciboleros, Comancheros and the cattle industry developed concurrently. The destruction of the buffalo and the advance of the cattle industry into west Texas forced the natives to shift to livestock raiding in order to survive. In order to continue trading, Comancheros had to accept new trade items, horses, mules, cattle and Mexican captives. Thus, New Mexico became a safe haven for stolen goods from Texas and Mexico, encouraging and prolonging

safe haven for stolen goods from Texas and Mexico, encouraging and prolonging the Indians' new economic pursuit. Comancheros thus indirectly affected the regions' settlement patterns because the trade allowed the Apaches to retain their stronghold over the Seven Rivers Valley until they were defeated by the Anglo military.

8.2 APACHE LAND USE

Seeking riches in the form of accumulated Indian wealth or by the discovery of new gold and silver mines, Spanish expeditions extended New Spain's northern boundaries into New Mexico. In the project area, the Spaniards encountered hunters and gatherers who interacted with the more sedentary riverine peoples. Spanish chroniclers accompanying the expeditions described land use patterns developed by diverse cultural groups in response to different environmental conditions. For instance, the Pueblo Indians were settled in villages in the relatively well watered northern areas and had an agrarian economy. The Plains Indians had a nomadic economy based on hunting and gathering, an occupation suited to the game-rich plains. Although terse and lacking in cultural details, the descriptions do provide an idea of local economic adaptations both before and immediately after the Spaniards settled in New Mexico.

Sixteenth century Plains Indians groups described by the Spanish explorers include the Jumanos, Querechos and Vaqueros. The Plains Jumanos ranged from northern Mexico into eastern New Mexico and eastern Texas. They subsisted on hunting, gathering and trading. Each year the Plains Jumanos returned from the plains to trade, socialize and winter at La Junta. Francisco Vasquez de Coronado first identified the Querechos as a hunting group who lived on the Llano Estacado. Subsisting primarily on hunting, the Querechos lived in hide tents and moved their possessions on dog travois. Don Juan de Onate described similar Indians in 1598, using the term Vaquero instead of Querecho.

A third subsistence strategy was employed by the Pueblo people. They lived in large villages and grew a full complement of crops including cotton. Flocks of domestic turkeys were raised. Cotton and turkey feathers were fashioned into blankets and cloaks. Pueblo men made occasional trips to the plains to hunt buffalo.

Trade networks bound these diverse groups together. The Plains Indians went to Humanas Pueblo to trade fresh meat, fat and hides for cotton blankets, turquoise, pottery and corn. Given the proximity of the salines to the Tompiro pueblos, salt was probably another trade commodity. Jumano traders acted as middlemen in a much broader interregional trade, linking the Tompiro Pueblos to La Junta in the south and the Caddos in the east.

8.2.1 The Pecos River Environment at European Contact 1582

The entradas are the sole source of information on the environment and inhabitants of the project area in the sixteenth century. Antonio de Espejo in 1582 and Castano de Sosa in 1590 led the only expeditions that traveled along the Pecos River through the southern region. Espejo did not encounter

any Indians in the project area and neither did de Sosa. However, de Sosa did meet natives near the Texas-New Mexico border. Alonso Jaimes, sent to reconnoiter a trail, met a large group of Indians he called Depesguans, whom George Hammond identifies as Plains Jumanos because Jaimes was able to speak to them through his interpreter. The natives were friendly gave him leave to travel through their territory and presented him with "many buffalo and chamois skins, fine shoes of the type they themselves wore, and a quantity of meat" (Hammond and Key 1966:256). Traveling north along the Pecos, they found a number of newly deserted rancherias near the Texas-New Mexico border. They saw natives near some large saline salt marshes on November 30. De Sosa mentions that these natives "had with them some dogs laden with packs" (Hammond and Key 1966:258). Later four Indians were captured while stealing oxen. One was hung as an example and the rest kept as interpreters. Each was assigned a Spaniard "in order that they might be taught our language quickly" (Hammond and Key 1966:255). This group was obviously not friendly nor did they speak the Jumano language.

Two hundred two kilometers (125 mi) southeast of Carlsbad the Spaniards passed rich salt beds and found a large recently deserted rancheria. On November 20th they saw a smoke column on a mountain 17 km (4 leagues or 11 mi) away. Hammond speculates that this was in the Guadalupe Mountains west of Carlsbad. The expedition also found "a large corral used by the Indians for enclosing cattle" (Hammond and Key 1966:260-261). This was undoubtedly a game corral similar to those described by Coronado and Onate. The Spanish reads ganado, a term which was consistently used to describe buffalo in the sixteenth century.

The expeditions traveled through the region in the fall, which is one of the reasons they did not encounter more natives. The only evidence of agriculture was an olla and fresh cornhusks found by a water hole near Roswell. The next day the de Sosa party found a large deserted rancheria which Hammond feels is the same rancheria that Espejo described in 1583 (Hammond and Key 1966:262). This correlation would suggest continuous if intermittent habitation of the rancheria for at least seven years. The discovery of fresh cornhusks may represent evidence of agriculture or trade with the Pueblos. De Sosa found numerous deserted rancheria sites along the Pecos River. The occupants had gone to the Llano Estacado for the annual fall buffalo hunt. The game corral was located on the east side of the Pecos River within range of the buffalo. In addition, de Sosa wrote that "there were a great many deer on the plains, the herds being so large that he was unable to count the animals" (Hammond and Key 1966:262).

De Sosa reached the Rio Hondo on December 1, "but we could not cross it as the water was too deep. We therefore turned east to cross the river we had previously followed, into which the other stream flowed" (Hammond and Key 1966:262). Prior to the introduction of irrigation and artesian drilling the entire middle Pecos region had not only a higher water table but more surface water. The Rio Hondo was at that time a deep, permanent stream with a rapid current.

In Forbes' (1960) opinion, the Seven Rivers valley was inhabited by the Seven Rivers Apache and part of the Faraon Apaches in 1590. Documents from

1620 and La Fora's map place the Siete Rios Apache in this region. De Sosa's entrada was the last official expedition to enter the middle Pecos region. The Siete Rios Apache are next mentioned in 1620, trading at Humanas Pueblo.

8.2.2 Seventeenth Century Trade Relations

The Pecos River Valley held little interest for the Spaniards because there were no minerals and the nomadic Apaches were not easily controlled. The Spaniards settled along the rivers near or in the Pueblos because they were dependent upon large, sedentary labor forces. Trade became the chief economic pursuit in New Mexico, supplemented native tribute and labor which was used for subsistence farming and stock raising.

The lower Pecos River remained the province of the Seven River Apaches throughout the seventeenth century. During the first half of the century, Spanish and Plains Jumanos trading parties passed freely through Apache territory. Both Apache and Pueblo traders went back and forth between Seven Rivers and Humanas Pueblo until Apache hostilities were aroused in the late 1660s. Then the Apache closed their territory to trade and concentrated on raiding, expanding their territory in the process.

Don Esteban Clemente, the leader of the Tompiro pueblos, had close ties with the Siete Rios Apache and frequently visited them in the Seven Rivers area. Governor Mendizabal had extensive personal trade operations with both the Plains and Siete Rios Apaches. As a result of his connections with the Siete Rios Apache, Don Clemente served as Mendizabal's agent. The governor supplied the goods and organized the trading expedition, an arrangement which proved profitable for both parties.

Traditionally, the Apaches traded buffalo meat, tallow, and hides as well as antelope meat and hides to the Pueblos for corn, textiles, and pottery. Corn and salt were undoubtedly important trade items between the Humanas Pueblo and the Southern Apache. The Apaches traded the same items plus captives to the Spanish for horses, metal goods and manufactured items.

The Plains Jumanos traded at Humanas Pueblo and served as middlemen between the eastern Caddoan tribes, La Junta and the Pueblos. Each year the Caddos held summer trading fairs where the Jumanos exchanged Pueblo turquoise and textiles for Caddoan bows made from the highly prized Osage Orange tree (John 1975:170). The Tompiro pueblos paid pinyon nuts as tribute to the Spaniards, so this item may have been traded also. In turn, the Caddos had abundant supplies of pecans. Both the Caddos and Humanas Pueblo had salt and corn resources, so it is doubtful that these were important media of exchange between them. Salt was an important trade item for the Spaniards. For example, Governor Mendizabal sent nine wagonloads of salt to the Parral mines in northern Mexico in 1659 (Hackett 1937:93).

The Jumanos traders, on friendly terms with the Spaniards, were always welcomed into the Tompiro Pueblos. Soon Spanish trade goods were added to traditional items as the Jumanos were the sole source of Spanish manufactured goods, metal and horses at the Caddoan fairs (John 1975:170). The acquisition of the horse proved profitable for the Jumanos because it allowed them to

increase not only their territorial range but the volume and variety of trade goods as well. Between 1630 and 1680, Jumano traders dominated the long distance trade networks and expanded into new territories. The Jumanos owed their dominant trade position to the horse and their monopoly on European goods. However, to their misfortune, the Apaches also adopted the horse and began expanding their hunting and raiding activities which eventually destroyed the Jumano trade and almost destroyed the Jumanos.

Trade was conducted peacefully throughout the first half of the seventeenth century until a deteriorating climate and Spanish policy upset the delicate balance of power in the region. New Mexico was dependent upon trade with the Plains Indians because hides and slaves were the main media of exchange for manufactured goods in New Spain. The slave trade was extremely lucrative, especially after the El Parral silver mines in northern Mexico began demanding more slaves in 1650. Not satisfied with the volume of war captives provided by the Plain Indians, New Mexico's governors encouraged raiding the Apaches in New Mexico to obtain additional captives to sell to the silver mines in the south. The Spanish were careful not to offend the Plains Indians; as a result, the Plains tribes, who were not subject to these attacks, remained on good terms with the Spaniards.

In 1659, against the advice of the friars, Governor Mendizabal initiated an attack on the Seven Rivers Apaches. The Apaches immediately raided Humanas Pueblo, killed two Pueblo Indians and drove off the livestock. There were further adverse effects in that the Audiencia of Guadalajara detected Mendizabal's illegal sale of 70 Siete Rios Apaches in El Parral. Thereafter, the Governor refrained from slave raids on the Seven Rivers Apache (John 1975:89).

There was no evidence of open hostility between the Seven Rivers Apaches and the Pueblos in 1660. The Apaches continued to trade peacefully at Humanas Pueblo and, more important, allowed Jumano and Spanish traders to move unmolested through their territory. In 1663, the Apaches of Los Siete Rios approached Cuarac pueblo at night and, mistaken for enemies, they were attacked. Two Apaches were killed and they were determined to take revenge until the Spaniards intervened. The Apaches agreed not to go beyond the pueblos of Humanas and Tabira "where they come to barter and the Indians of Cuarac have been ordered not to go" beyond the pueblos of Humanas and Tabira "at the times when the Apache Indians of Los Siete Rios should come to trade ..." (Hackett 1937:143).

In 1667, Don Esteban Clemente sought to revive the failed revolt of 1650. The Seven Rivers Apaches were involved in the plot indicating that relations between the Tompiro Pueblos and Apaches were still amiable. The revolt was crushed and Don Clemente was hanged. The Spaniards forced the Humanas Pueblos to accompany them on raids against the Apaches (John 1975:93).

Taking advantage of Humanas's weakened condition, the Siete Rios Apache attacked in 1670, killed eleven inhabitants, profaned the church, captured 31 women and children and ran off the livestock. This was the first of a series of raids which would eventually depopulate the Tompiro Pueblos by 1680.

As early as 1677, the Seven Rivers Apaches had expanded their range to El Paso. They formed new alliances with the Apaches of the Organ Mountains and the Gila Apaches and began raiding the Rio Grande pueblos, El Paso and Spanish supply trains. The Seven Rivers Apaches were frequently mentioned in Spanish records between 1685 and 1691 (Forbes 1960:167).

Jumano commerce declined when its traditional market, the Tompiro Pueblos, were destroyed. The expulsion of the Spaniards from New Mexico in 1680 ended Spanish trade as well. Juan Sabeata and eleven other Jumano delegates visited El Paso in an attempt to recover their dwindling trade. They wanted to know why the Spanish traders had stopped visiting their camps. In addition, they requested Spanish aid against the Apaches who were blocking all of the trade routes to the eastern pueblos, preventing the Jumanos from forming new trade alliances (John 1975:174-175). When the Spaniards returned in 1715, the Jumanos had allied with the Apaches in order to survive.

8.2.3 Comanche Influence on the Apache, Spanish, and Pueblo Relationship

Comanche raids began in the early 1700s and increased until in 1719 they began to affect New Mexico's vital trade with the Plains Indians. The Spaniards delayed in sending help to the beleaguered Jicarillas, Carlaras, Faraones, and Cuarteles until, by 1750, the Comanches had replaced the Apaches as the dominant force on the Southern Plains (Kenner 1969).

Despite occasional Comanche raids, trade continued at the Pueblo trading fairs, and New Mexico traders were not barred from the plains. As late as 1739, they were trading horses, axes, awis, and knives to the Padoucas on the Kansas plains. In fact New Mexican traders expanded trading operations, offering an increased range of manufactured goods and food including beads, trinkets, cookware, bread and cornmeal in exchange for buffalo hides and meat. The Comanches confined themselves to sporadic raiding and trading until 1740. After 1740, French trade goods were available and the Comanche were no longer dependent upon the Spaniards for European goods.

8.2.4 The San Saba Mission Accounts of the Southern Apache 1763

Governor Tomas Velez Cachapin of New Mexico sent an expedition to the recently established Presidio of San Saba in 1763. San Saba was situated on the Rio Colorado in present-day central Texas. He was interested, first, in determining if it fell under his political jurisdiction and, second, in establishing trade. After traveling 323 km (200 mi) in 7 days, they encountered a Lipan Apache village 27 km (17 mi or 6 leagues) east of the Pecos River and 323 km (200 mi) southeast of Pecos Pueblo. They stayed for five days at a large rancheria which had 300 warriors. Comanches attacked the village, wounding Francisco Romero (Weddle 1964:153). Traveling for three more days they found a Mescalero rancheria in Los Medanos. They were welcomed until two Mescaleros from another band came in wounded. The Mescaleros turned on Romero and Miravel, seizing their horses, arms, clothing, and documents. Romero noted that the Mescaleros had several horses, mules, donkeys, long rifles, and arquebuses, as well as Spanish clothing, indicating that the Mescaleros had been raiding Spanish settlements. Francisco Romero and Joseph Miravel escaped, traveling 9 km (6 mi or 2 leagues) to another

Lipan village where they obtained guides to San Saba (Castaneda 1936:187). The location of the large Lipan rancheria in the approximate vicinity of Roswell is in the general area where both de Sosa and Espejo described a large rancheria, although it is doubtful that the same site is involved. After leaving the Lipan village, the Romero-Miravel party traveled for three days, making it possible that Romero's Los Medanos was in the same location as the present-day Los Medanos on the James Ranch.

The Pecos River Valley was a fertile land with many springs, abundant "salt" (probably gypsum or potash) deposits, wild grapes, and fruits of different kinds. Both Lipans and Mescaleros camped in the dunes near the river and regarded the Comanches and Spaniards as enemies.

In the seventeenth century, the Spaniards used place names such as Seven Rivers or the Organ Mountains to refer to Apaches in those regions. Romero states that the Spaniards in New Mexico called the Southern Apaches Faraones while the Spaniards in Texas referred to them as Mescaleros. The Seven Rivers Apaches and the Faraones were able to retreat to the mountains for protection, enabling their traditions and identity to remain intact until the Anglo incursion in the nineteenth century.

8.2.5 Don Antonio Cordero's Account of the Southern Apache 1796

Raids on Spanish settlements in northern Mexico increased in proportion as the Eastern Apache were denied access to the plains for buffalo hunting. Spanish policy vacillated back and forth with the Spaniards allying first with the Mescaleros and then the Lipans. Finally, in 1787 the Spaniards set up Establecimientos de Paz (Peace Establishments) in an attempt to control the Indians on reservations. Don Antonio Cordero's description of the Apaches was one of the benefits of the increased control.

Don Antonio Cordero noted that while the Apaches spoke the same language they represented different subcultural units. In 1796, the Faraones lived in the mountain ranges between the Rio Grande and the Pecos River. A group of Mescaleros lived in the Guadalupe Mountains near the Pecos River and their territory extended on both sides of the river to Comanche territory (Matson and Schroeder 1957:354). The Faraones and the Mescaleros frequently joined to raid Spanish settlements in Nueva Vizcaya. The Mescaleros also banded with the Lipanes to hunt buffalo on the plains.

Wild foods used by the Apaches included riverine and mountain species. Game animals were burros, deer, antelope, bear, wild pig, and porcupine. Common plants were tuna (cactus), datil, pitaya, acorn and pinyon, with the most important being mescal. The Apaches also grew corn, squash, beans and tobacco (Matson and Schroeder 1957:338-339).

For the Apaches in 1796, raiding had not yet become a necessity. The primary source of food was still hunting and gathering with some agriculture. The Faraones at least still occupied the same territory, as did the Seven Rivers Apache, now identified as Mescaleros. Spanish pressure was being exerted from the south as evidenced by the Establecimientos. All of this began to change by 1820.

During the Mexican War for Independence in 1821, the Spaniards lost control over the natives, who began leaving the settlements. The New Mexican government was forced to renegotiate a peace treaty in 1831. Once again the Mexicans tried to reduce the Apaches to settlements. The Apaches revolted in 1833 and went on a rampage throughout northern Mexico. Livestock, women and children were transported north to Comanchero trading centers located along the Pecos River. Cattle and mules replaced buffalo robes and meat as barter items for muskets and powder. Raiding became a necessity for survival because the Apaches no longer had access to the buffalo plains. The Apaches became increasingly concentrated in the mountains, severely reducing game supplies (Sonnichsen 1958:69).

The Mexicans, like the Spaniards before them and the Anglos after them, embarked on a policy of total extermination. The governors of Sonora, Chihuahua, and Nueva Vizcaya started paying bounties for Apache scalps. This measure only served to increase the raids between 1838 and 1845.

The United States inherited all of Mexico's Indian problems with the signing of the Treaty of Guadalupe Hidalgo in 1848. According to the terms of the treaty, the United States was supposed to suppress the trade in plunder and slaves. Although the American government built garrisons along the major plunder trails, they had little effect and the United States was unable to comply with the treaty terms.

8.3 CIBOLEROS AND COMANCHEROS 1786-1878

The Comanche Peace in 1786 opened up the plains to ciboleros (buffalo hunters) and Comanchero traders. Cibolero expeditions were mounted by wealthy men, who hired the poor to serve as skinners and butchers. Several caravans would join together for the fall buffalo hunt. At first buffalo hunting was on a small scale but by 1830 ciboleros were killing a minimum of 10,000 to 12,000 a year (Kenner 1969:101). El Cuate, a former buffalo hunter, describes the preparation for hunting buffalo in 1860.

Caravans of ten to thirty wagons were formed from different villages; each wagon pulled by four or five yokes of oxen... Being poor, I went along as an agregado (assistant). Our job was to help skin the animals and to cut the meat into strips to make tasajo, jerky. We were too poor to organize a caravan of our own, so we were glad to be allowed to join as helpers and in that way secure meat for our families... (Cabeza de Baca 1954:40)

Ciboleros carried trade goods as did the Comancheros, but their primary aim was meat and hides. El Cuate mentioned some of the trade goods ciboleros generally carried.

The Comanche Indians had been friendly with the ciboleros for more than a century. As we traveled into the Ceja and the Llano to hunt for buffalo, we carried with us bread, panocha - sprouted

wheat pudding, whiskey, guns, cotton fabrics, beads, knives, and other articles. These we traded with our friends, the Comanches (Cabeza de Baca 1954:47).

The ciboleros were on much better terms with the Comanches than with the Americans. Ciboleros ran the buffalo and landed only enough for one day's work whereas the Americans took a stand and shot as many buffalo as possible.

Ciboleros came from Mexico as well. The cacevans came from Chihuahua, Mexico, and after going to the salt lakes, they traveled along the Delaware River to the Pecos and thence up to Fort Sumner. The Delaware Creek-Pecos River route (Figure 2.1) was a well known and frequently used trail (Shinkle 1970:39-42). The presence of Mexican ciboleros is further substantiated by Lily Klasner's interview with Roman Aragon. Roman Aragon, a cibolero from Mexico, decided to settle along the Ruidoso River after passing through the region on the way to hunt buffalo. Aragon and others encouraged their friends and family to move to New Mexico in 1835 (Klasner 1972:51-52). This may have been a common practice. There are a number of undocumented small settlements along the Hondo, Ruidoso, and Borito valleys. Small settlements such as Las Chozas, La Junta, Berrenio, El Leoncote, and La Boquia are mentioned but not described by American settlers. Mexican ciboleros contributed to the early settlement of the Hondo Valley.

The herd was severely diminished by 1853 and the dwindling resource had become a point of contention among the Comanche, American, and Mexican buffalo hunters. American Indian agents were equally alarmed because they realized that when the buffalo were gone the Comanches and other plains tribes would increase their raids on Texan and Mexican cattle herds out of necessity. Cibolero activities indirectly affected settlement patterns in the region by reducing the buffalo, destroying the Comanches' subsistence base. Many ciboleros became Comancheros and then herded cattle for John Chisum. The cibolero era ended when the southern buffalo herd was exterminated in the winter of 1878.

8.3.1 Comanchero Activities 1736-1878

The Comanche Peace settlement opened up the plains not only to buffalo hunters but to traders as well. As the bulk of trading ventures took place on the plains the trading fairs declined in importance. By 1800 the Comancheros had moved their headquarters to San Miguel del Vado and Anton Chico on the upper Pecos. Prior to the Anglo invasion in 1848, Comancheros traded traditional items such as lances, tobacco, sugar, tomahawks, metal arrowpoints, dried bread, cornmeal and flour. The Comanches particularly valued the tomahawks, trade bread and tobacco. Blankets, cloth, guns, powder, and lead were obtained from the Osage and traded along with horses, mules, buffalo robes, and meat to the New Mexican Comancheros (Kenner 1969:84-86).

The nature of the Comanchero trade changed between 1840 and 1850. By 1850, there were designated rendezvous points. On the Pecos River, the cottonwood groves at Bosque Grande and Bosque Redondo in the vicinity of Fort Sumner were centers for the Comanchero trade. Mescaleros came from the south, Kiowas, Comanches and Lipan Apaches from the east and Mogollons from

the west to trade horses, mules, cattle, sheep, captives and other stolen goods. New Mexico became the outlet for stolen goods taken in northern Mexico (Bailey 1966:45-46). There were "well worn trails or roads made by the Comanches" following the Pecos up to Anton Chico. Captain B. Chandler noted that "thirteen distinct paths were counted running parallel to each other" (Bailey 1966:46).

Anglo ranchers began moving into the eastern border of New Mexico and settling below Anton Chico at the same time that the Comanches were being pushed into New Mexico from Texas. Continual friction between Anglo ranchers and Comanches erupted into hostilities. Anglo ranchers in Texas and New Mexico demanded military protection. The United States was unable to control the trade until the Gadsden Purchase in 1853. Additional forts and troops were then placed on the major trails. The eventual defeat of the Apaches and Comanches and their reduction to reservations ended the Comanchero trade (Kenner 1969:29-31).

8.4 NEW MEXICAN HISPANIC MOVEMENT INTO THE HONDO VALLEY

After the Comanche Peace, growing population pressures and a burgeoning sheep industry led Hispanic settlers to expand along the eastern edge of the mountains to the Pecos plains. This expansion was curtailed between 1846 and 1850 when 450,000 sheep were stolen or killed by the Apaches (Kenner 1969:29-31). The Apaches rather than the Comanches presented the greatest barrier to settlement in southeastern New Mexico in the nineteenth century.

La Placita (Lincoln), the first settlement on the Bonito River, was founded in 1849 by native New Mexicans from Socorro. It was very different from the defensive plazas in the north. Other than a tower and an abbreviated casa-corral system for the houses, La Placita possessed few of the features associated with Hispano towns. Instead of a central plaza flanked by houses, the houses were located along the central street. The economy was based on agriculture and the plots fronted the Bonito River.

La Plaza de San Jose, settled in approximately 1867 by New Mexicans from Manzano, demonstrates even further modifications. Like La Placita, San Jose's houses were scattered along the main street and the town had a community corral.

La Plaza de San Jose was called Missouri Bottoms or Missouri Plaza by Anglos. Lily Klasner called it Missouri Plaza when she visited in 1867 shortly after its founding. The name San Jose and the fact that it was settled by Hispanos were forgotten. By 1963, local historians assumed it was an Anglo town established by freighters from Missouri (Schaasfma 1967:7). Archaeological excavations demonstrated that the house patterns were Spanish and not Anglo. The surveyor's notes mentioned that the town was called San Jose in 1867. Based on the name and the town layout archaeologists had assumed that Missouri Plaza was one of the earliest Anglo towns in the region when, in fact, it was one of the latest Hispano towns (Wilson n.d.a).

The Hondo Valley (Figure 2.1) was the most southerly area settled by Hispanos. Anglos settled and developed the area south of the Hondo to the

Texas border in southeastern New Mexico. Apache hostility, the lack of irrigable streams south of the Hondo, and the influx of American settlers between 1866 and 1873 prevented Hispano expansion into the Seven Rivers - Carlsbad area. Anglo social patterns and economic development dominated southeastern New Mexico. The Hispanic population was late coming to the area and less entrenched economically than in the north. Anglos came into towns such as La Placita and gradually took over the businesses and political positions. This became a pattern in towns established by Hispanics. Towns founded by Anglos had separate communities for Hispanics. Inhabitants of Spanish-speaking descent in southeastern New Mexico refer to themselves as Mexican-Americans, not Hispanics. Most of the Mexican-American population came from Texas and Mexico and the region is called "Little Texas" (Interview with Mr. Anaya).

Fort Stanton (Figure 3.1) was established in 1855 to control Apaches. The Apaches and the settlers were on fairly peaceable terms from 1854 to 1860 when they received regular supplies at Fort Stanton (Opler and Opler 1950:17). Trouble developed when the Confederates invaded New Mexico, razed Fort Stanton and antagonized the Indians. General Carleton and the California Column regarrisoned Fort Stanton in 1862 and commenced an intensive campaign against the Mescaleros. The Mescaleros, greatly reduced in number, armed only with bows and arrows, and isolated from food supplies, surrendered and were placed on the Bosque Redondo Reservation (Opler and Opler 1950:14). The cattle industry in southeastern New Mexico developed to supply the forts and reservations produced by the Anglo-Apache campaigns.

8.5 ECONOMIC DEVELOPMENT OF THE LOWER PECOS VALLEY BY ANGLOS

Cattle ranching was the dominant economic force in southeastern New Mexico from 1866 to 1900. Oliver Loving and Charles Goodnight created the first cattle trail along the east bank of the Pecos River in 1866. John Chisum followed in 1868 and established cow camps along the east bank of the Pecos. These were generally makeshift affairs where the men lived in tents or built chozas (dugouts). These small operations usually had two to three cowboys, a small herd and a wagon and ox team. After two to three years, the owners built an adobe house and hired Hispanics from either Fort Stockton or Fort Sumner (Klasner 1972:51).

Pearce and Paxton were the first men to establish a cow camp in 1870 above Popes Crossing. Following a typical pattern they claimed miles of land fronting the river. "They selected the east side so they would have a good lookout for Indians who always came from the west and supposedly could be seen as they crossed the river, giving the settlers time to prepare for the attack" (Klasner 1972:65-66). In 1873, John Chisum moved his herd to Bosque Grande on the Pecos near Fort Sumner, and claimed 150 miles along the river. By 1875, John Chisum employed 100 cowboys and had 80,000 head of cattle (Keeler 1962:50). Joe Nash and Jim Rammer had a cow camp above Popes Crossing on the east side of the river. Buck Powell herded cattle for R.K. Wiley of Fort Worth in the same area. These were the only residents on the lower Pecos in 1873 according to Lily Klasner (Klasner 1972:66).

Lincoln County was formed in 1869 and La Placa (now Lincoln) became the county seat. According to the 1870 federal census the population was predominantly Spanish-American and lived along the Pecos, Tomito, and Hondo valleys. While there were occasional Apache raids, most of the settlers suffered from the general lawlessness and violence occasioned by Anglo participants in the Lincoln County Wars. The Apaches confined themselves to capturing livestock, usually from John Chisum's herd.

Seven Rivers (Figure 2.1) was the first substantial American town near the project area. Dick Reed and George Hong built a store in Seven Rivers to supply the cattle industry. Survey Plats from 1879 to 1882 indicate that there were only six homesteads within a three to six mile radius of Seven Rivers. Seven Rivers was the most populous township at that time but was not an established village until 1884 (Hendley 1982b).

Early towns like Look Out, Seven Rivers, and Eddy based their economy on ranching. However, when the cattle industry started declining in the late nineteenth century, towns like Seven Rivers declined along with it. Seven Rivers had additional problems in that artesian drilling in 1890 affected the seven springs and the rivers began drying up. After Eddy County was formed, Seven Rivers lost the county seat election to Eddy. The final blow came when Lakewood became the supply center for the construction of McMillan Dam. By 1896, the post office was gone and Seven Rivers declined.

Cattle ranching in the area was limited to the Pecos River until the introduction of deep well drilling and windmills. Early cattlemen settled on the edge of the cattle drift, the distance a cow could travel from the river and still make it back for water. Klasner mentions that Paxton and Joe Nash set up their cow camps along the Pecos River in 1873. Captain Lebo's cavalry expedition in 1879 does not mention any ranch in the area except for Paxton's ranch on the east side of the Pecos. On patrol for Mesqueros which had reputedly attacked a sheep herder, Captain Lebo's squad marched five miles from Paxton's ranch to the head of a large salt lake. This could possibly have been Nash Draw. Captain Lebo identified the lake as the Black River Salt Lake. Continuing due east, the cavalry followed an Old Indian trail through sandy rolling country towards Dog Springs on the Llano Estacado. The grass was very good and there was plenty of wood for at least 25 miles from the head of the salt lake. Eleven miles farther at Dog Springs, the grass was poor and wood scarce. Water was obtained by digging out the "well." Lebo reported that "water can always be depended on here by digging for it" (Myers n.d.b:4). The cavalry continued on another 20 miles to Monument Springs which had "plentiful water" of excellent quality. Although there were no recent signs Captain Lebo remarked, "This place was evidently a favorite resort of the Indians at some period. There are a great many trails leading out in different directions" (Myers n.d.b:4).

This is the only official account of the region around Nash Draw and Livingston Ridge, in Lee Myers's opinion. It confirms that the region was frequently utilized by the Indians and had sufficient grass and water to sustain nomadic and seminomadic groups. The old Indian trail led directly onto the Llano Estacado. Local collectors in Carlsbad report finding numerous projectile points, manos and metates in the area. In fact, the Maroon Cliffs

and the sand dunes are the favorite area to collect artifacts and have been so for decades. The presence of cultural artifacts in such quantity suggests the occurrence of hunting and gathering activities over a long period of time. In addition, there are numerous springs scattered over the area. Each of the wells is located by a spring, and the salt lake has covered other springs. Local ranchers report that the Salt Lake has doubled in size since 1930. Past researchers have stated that the land was neither utilized nor inhabited when, in fact, what was meant was that the area was not settled or utilized by Europeans. Apache and doubtless Comanche groups did live in the region and exploited its resources to the maximum.

8.5.1 The Expansion of Cattle Ranching to the Llano

The cattle industry developed first along the Pecos and, consequently, it was the first region to suffer from overgrazing. Falling cattle prices, drought and the reduction of grass cover convinced C.B. Eddy that ranching was no longer a profitable enterprise. In 1887 he formed the Pecos River and Investment Company and started promoting the construction of dams and irrigation works on the Pecos. The entire enterprise suffered a series of false starts and setbacks; however, by 1893 McMillan Dam was finished and a railroad line connected Eddy to Roswell by 1894. The project continued to be plagued by floods and financial difficulties but it did contribute to the replacement of cattle ranching by irrigation farming as the major industry along the Pecos River. Farming communities like Vaud (Loving) and Malaga developed on the east side of the Pecos.

Cattlemen like Joe Nash and H.J. Rammer responded by moving their ranching operation to the Llano Estacado. The grass was still good because the area could not support heavy concentrations of cattle until the introduction of deep wells. Josiah Nash was ranching in the general area of the Nash Well and James Ranch in 1897. Joseph James visited the Nash Ranch in 1897 and returned to buy it in 1898. Charlie James, Joseph's grandson, stated that his grandfather was a well digger and that he dug the Nash Well (Interview Charles James). The Nash Well was first recorded in the Bureau of Land Management records in 1898 as the North Well but, according to Jim McCormick in the Bureau of the Land Management, it has always been known as the Nash Well.

Josiah Nash and his partner were first mentioned by Lily Klasner in 1873. In 1881, Josiah Nash was listed as a taxpayer in precinct #5 which included Eddy County. His exact location is difficult to pinpoint because he never filed for a land patent. Klasner places his original cow camp on the Pecos River above Pope's Crossing. In 1880 Mrs. Beckwith sold her cattle to Joe Nash near Seven Rivers (Myers and Rasch n.d.a). Josiah Nash is listed on the 1885 census, which included families living south and east of Carlsbad in locations such as Pierce Canyon, Slaughter Canyon, Rattlesnake Springs and Black River. Josiah Nash was number 63 on the census and H.J. Rammer was number 64, suggesting that they were still partners in 1885. Josiah was 31 in 1885, still single, and his occupation was stock raising. H.J. Rammer was also single, age 34 and a stock raiser (Hendley 1932a:Vol.1, #2, :74).

The Production of Agriculture schedule attached to the 1885 census lists Nash as the owner of 160 acres of unimproved land. On June 1, 1885, he possessed 2000 head of cattle, 100 head of horses, four mules, seven swine and 21 chickens. Nash sold 2000 head of cattle in 1884 and his calf increase from 1884 was 325. H.J. Rammer also had 160 acres of unimproved land, ran 1000 head of cattle but no horses. He sold 1000 head of cattle in 1884 and 190 was his total calf increase from 1884 (Hensley 1982a:Vol.1, #2:77).

Green London told me that Nash and Rammer were partners and that they headquartered at the Nash Well. Mr. London thought they moved into the area in 1894 and built an adobe house by the well. James bought out Nash in the same year that Livingston came, which would have been 1898 (Interview with Green London). There were still Indians in the area in 1898; they used to water their horses at the spring north of the Nash Well. Charlie James said that Nash had a caretaker named Jake Owens who was friendly with the Indians. Owens lived in a half-choza (half-dugout) dug in the bank until he went blind and moved to Carlsbad. According to Charlie James, Nash moved to Arizona or Colorado after he sold out because his business was raising horses (Interview with Charles James). Green London stated that he knew Joe Nash when he was an old man. Joe Nash does not appear on the 1900 census so apparently he was not in the region in 1900. It is possible that he returned at a later date. It appears that Joe Nash was one of the first ranchers in the area although he did not settle permanently; Nash Well and Nash Draw bear his name today.

Charlie James said that in 1898 the region was covered with grass and there weren't many mesquite trees. "I remember that my grandfather said there was nothing to tie a horse to. It was a lot wetter in those days with tons of grass. I remember frogs in the desert. There were javelina hogs, bobwhite quail, sand deer, prairie chickens, and armadillos" (Interview with Charles James). The James established their headquarters at the present-day site of the J.C. Mills ranch. The James Brothers filed for their land in 1927. Charlie James stated that "ranchers only buy land near the wells; it is cheaper to lease the land than to pay taxes." At one time the James Ranch included 225 sections and grazed thousands of cattle. Charlie James inherited 63 sections but had to sell nineteen so that now he cares for 44 sections. Mr. James was very vague at this point; I assume he is referring to grazing or leasing rights rather than outright ownership. The James family used to drive from Midland to the ranch. The cattle were watered in the Jal area and at Johnson and Madero. After Madero, the cattle went two days without water until they reached Nash Well. Joseph James lived on the ranch during the week and returned to Carlsbad on the weekends. His son and grandson did the same. His wife and children lived in town so that the children could go to school. Mrs. James told me that her husband had to drive 26 miles on sand roads with numerous gates. Since the car got stuck each time he stopped to open a gate, it was not practical to live in town and drive to the ranch everyday as he does now. Although the actual homesite of the James ranch is owned by J.C. Mills, the James still own land and ranch in the area.

Jim McCormick and others informed me in confidence that at one time the James Ranch had 3000 cattle per section. The land was severely overgrazed, forming the large sand dunes south of the J.C. Mills ranch. The Bureau of Land Management had to step in and remove most of the cattle, who were

starving. The Bureau has been attempting to restore the land, but it has been a slow process.

The other ranch in the vicinity of the project area was the Morgan Livingston Ranch. Morgan Livingston was listed in the 1885 census as living on the east bank of the Pecos River with his wife Amanda and three children. Livingston evidently moved to New Mexico after 1880 since he does not appear on the 1880 census and his youngest son, age three, was born in Texas (Hendley 1982a, Vol.1, #2:71). The 1885 Production of Agriculture schedule indicates that Livingston owned 600 head of cattle in 1885 but no land (Hendley 1982a, Vol.1, #2:76). Green London stated that Livingston headquartered at the J Bar F Well. This well is located in Nash Draw 2 miles east of Lindsey Lake and 2 miles north of Highway 128. He had a rock and adobe house built from the rocks in the old stone corral at Lindsey Lake. Mr. London was slightly confused about dates; at one time he said Livingston came to J Bar F in 1894 but later said he came when Nash sold his land, which was in 1898. Mr. London said that there was a choza dug in the side of a hill "with springs all around" at Lindsey Lake. The springs and most of the corral are now covered by the Salt Lake (Figure 2.1).

Jake Owens and John Cantrell herded cattle in the Livingston Ranch area. An old tale records that their cow hands started playing poker one day and got carried away extending their game until sundown. By that time the cattle had drifted away and were lost; the men were fired, and the lake where they played was named Poker Lake. This tale may be fiction, but the presence of an abandoned choza and corral and the casual mention of Jake Owens and John Cantrell indicate that there were a number of temporary residents who drifted in and out.

Livingston moved his headquarters to the present location of the Kenny Smith Ranch about 4 miles upstream from the J Bar F Well, in 1904 and in 1908 got a patented deed for 160 acres. Mr. Livingston also had a ranch at Twin Wells. At his main headquarters, he built a two-room wood house, a wash house and a 12x28' cook house. The main house and wash house are still on the property although Kenny Smith's house is built where the original house used to stand. Mr. London stuccoed the buildings and lived there when he was Mr. Crawford's ranch foreman. From 1921 to 1926, the Livingston Cattle Company ran 8,000 to 10,000 head of cattle and 125 saddle horses on their ranch (interview with Green London). Morgan Livingston bought into the Carlsbad Bank and put up the ranch for collateral; he lost it to A.J. Crawford in 1925 or 1926 (Interview with Kenny Smith).

A.J. Crawford appears on the 1900 census with his wife. His occupation was listed as a sheepman (Hendley 1982a Vol.2, #2:58). A.J. Crawford assumed control of the ranch in 1925. According to local informants, he made his money from sheep, hotels and oil leases. From 1926 to 1938, Crawford had a partner named Johnson; Green London at one time had a quarter interest in the ranch. The property was listed as the Crawford Ranch from 1939 to 1956 when it was sold to the Valley Land Company. Mr. Crawford was a reclusive individual; none of the informants could provide information about him or his business activities. Mark and Kenneth Smith purchased the ranch in 1960, and today it is owned by Kenneth Smith.

Visitors were eagerly anticipated when Green London lived at the ranch. When Mr. London saw a horse ride up over the ridge he put on a pot of coffee and warmed up the beans so they would have something to eat when they got to the ranch house. In Mr. London's opinion, hospitality was more limited at the James Ranch: "They never even offered a cup of coffee". Ranchers used to have joint roundups at the state line. The cows were separated according to brands, and then the calves were branded. During the turn of the century ranchers formed a tight community (Interview with Green London).

Indian artifacts were "lying all over the place." Mr. London used to casually pick up projectile points. One day he found seven metates layered inside one another on the ridge by the water tank. They were upside down with manos underneath them. Kenny Smith has also found numerous projectile points which he gave away. He has not found any metates (Interview with Kenny Smith).

8.5.2 Anglo-American Homesteading

Ruth Pue and her husband started homesteading on land west of the Livingston Ranch in 1932. They attempted to claim 640 acres under the Taylor Grazing Act, but because they were in a potash basin they were only allowed 160 acres. The Pues received a land patent in 1940. Ruth Pue laughed and said, "Homesteaders east of the Pecos were shot by ranchers, but I never had no trouble." In fact, there was a lot of turmoil. Local ranchers viewed the Pues as squatters and took them to court. Kenny Smith said that if it had been the old days they would have been run out with guns, but since the ranchers were civilized now, they took the Pues to court. The court found in the Pues' favor and the local ranchers felt they had "donated" their grazing land to them (Interview with Kenny Smith). This incident suggests that ranching needs as well as climatic conditions were the factors limiting settlements east of the Pecos.

The Pues were not technically ranchers and never ranched on the same scale as the Crawford or the James Ranch. Ruth Pue and her husband lived in a tent with a floor and hauled water until they dug a well. Since they did not have electricity until 1980, the Pues relied on a wood cook stove for both heating and cooking. They burned kerosene lanterns at night. Early in their occupancy the mines were just starting so they made extra money selling milk to the miners. They kept eight or ten dairy cows and a small herd of cattle. The family herded the cows and drove them to the stockpens in Carlsbad using horses, although a truck picks them up now. In 1942, they built a small country store with a single gas pump, and most of their business came from the mines. Ruth used to buy fruit in Ruidoso and trade canned goods for sweet potatoes and cabbage with a man in Carlsbad. The Pues represent an anomaly in the area. They came to the area after large scale ranchers were established and lacked sufficient capital and perhaps water to run large numbers of cattle. Unable to develop a large ranch, they turned to commerce with the local mining industry as an economic supplement.

8.5.3 Effects of Land Use on Environment

All of the informants agree that at one time there was more water, grass and fewer mesquite bushes in the area. The environment has steadily deteriorated since the introduction of intense cattle grazing in the area. Mr. London stated that before 1921 there was more water and grass; after 1921 the grama grass was replaced by burro grass which was not as good fodder. Today, due to overgrazing and severe droughts in the thirties and fifties, the area is dominated by shinny oak and mesquite. Mr. James complained about the broomweed which has invaded his land, and Mr. Smith has to move his cattle in the spring to keep them from eating the oak leaves which have a high level of tannic acid at that time.

Ranching remained the primary occupation until gas and oil explorations and potash mining started in the 1930s. The land around the Livingston and James Ranch was used for ranching and not farming according to the informants. The underground water supply is being steadily affected by the potash mines. The increase in size and salinity of the Salt Lake has affected at least three wells. Mr. Smith lost two wells including the J Bar F. The Nash Well was covered by the Salt Lake in 1958. Of the four original wells in the region, only the James Well and Hill Tank are still operating. Runoff from the salt tailings has also affected the Pecos River and farming operations on the Harroun Farms. Water from the Pecos used for irrigation leaves heavy salt deposits on the land; the water is almost too salty for cattle (Interview with Mr. Mobley).

8.6 MEXICAN-AMERICAN SETTLEMENT IN THE LOWER PECOS VALLEY

Hispano settlement did not occur in the Lower Pecos Valley before Americans started settling in 1873. The Hispanic sheepherding industry suffered a major setback in 1850 and had not expanded into the southern portions of the Pecos before Anglo cattlemen controlled the land. Hispanos could have settled around Seven Rivers, the Black River and Delaware Creek but were prevented from doing so by the Apache. After Anglo forts were established in the region and the Apaches were subdued, Anglo settlers came in and took the land.

The first Mexican-Americans in the area followed the cattle herds from Texas. Others came from Texas and Mexico to build the dams and work on the farms. There was an established Mexican-American population by 1890 in the Carlsbad region. Many Mexicans migrated from Jalisco during the Mexican Revolution. Mexicans originally settled in Chihuahua on the east bank of the Pecos across the river from Phoenix, New Mexico. In 1892 the Mexicans crossed the river and founded Phoenix, one mile south of Eddy (Carlsbad). Cleofas Bajos built the surviving Phoenix adobe as a boarding house for travelers. However, because the town of Eddy prohibited gambling and the sale of alcohol, saloon owners started building in Phoenix. Phoenix and Lone Wolf (a similar town founded by Mexicans) became the centers of gambling, drinking and prostitution in the area. Prostitutes from Phoenix rented rooms in Mr. Bajos' boarding house and Mrs. Bajos's washed their clothes (Interview by Lee Myers with Francisco Pompa).

the church near present-day San Jose in the south Carlsbad area (Interview with Ray Anaya). The San Jose church was completed in 1903. The first records date from 1898 but are sporadic and do not contain enough information to reconstruct early society in Phoenix and San Jose.

The 1900 census lists over 200 Mexican-American families living in Carlsbad and along the Black River (Figure 2.1) (Hendley 1982a:1900 Census). Most of the men were employed as day laborers and sheep shearers. There were also two blacksmiths, one teamster and a gambler. There were several farmers and they owned their land free or mortgage in most cases. Women were employed as housekeepers and laundresses. There were also two sporting women although this occupation was by no means limited to Mexican-American women (Hendley 1982a).

Carlsbad, like Roswell, had a large Mexican-American population living in a separate district. A rigid social hierarchy evolved with Mexican-Americans on the bottom. St. Edwards church served the Anglo Catholics and San Jose ministered to the Mexican-Americans. Mexican children were not allowed to attend school until the local priest staged a sit-in on the school steps. San Jose was the last district in Carlsbad to have running water, paved streets and electricity. These services were installed only after three leaders, including Mr. Acosta and Francisco Pompa, mobilized the Mexican community. Mexican-Americans were restricted to certain streets in Eddy and could only buy groceries at one store. They were not allowed to ride the mine buses until after World War II. This pattern was typical of Anglo communities in southeastern New Mexico.

There were other Mexican-American towns scattered throughout the Black River area (Figure 2.1). Most are now gone and only their graveyards record their existence. Look Out, founded in 1892 and a ghost town by 1897, had a sizable Mexican-American population judging from the names in its graveyard. Little Cuba, located four miles west and one mile north of Loving, had 15 to 20 houses in 1917. A.D. Baxter built a schoolhouse there because "there were so many children." The people were very clannish and distrusted "gringos." At one time there was a small race track and a cemetery. The graves are being plowed under and all traces of the buildings are gone (Bill Balgeman interview with Luke Fletcher).

During the 1930s, Harroun Farms on the river east of Malaga, built a company town for their Mexican-American workers. The settlement, called Chili, had a church, a school, blacksmith shop, company store, and living quarters for the workers (Bill Balgeman n.d.). Chili was a true company town; workers were paid chits which they could exchange for food and clothing at the store (Interview with Mr. Mobley). The farm went bankrupt and was eventually purchased by the city, which has the first water rights on the Pecos. After the town went out of business, workers dispersed to Loving and Malaga.

Mexican-American culture in southeastern New Mexico is distinct from the rest of New Mexico because its population came from Mexico and Texas rather than New Mexico. Mexican-Americans did not interact with the Anglo population. They lived in their districts within Carlsbad, Loving and Malaga

or built their own towns like Cuba. Economic opportunity was limited and in part determined by Anglo society.

8.7 SUMMARY

At contact, plains natives were nomadic hunters and gatherers. Raiding and hunting activities were restricted because the dog was the only means of transportation. Once the horse was adopted, nomadic groups expanded and sedentary groups contracted.

The Apaches displaced the Jumanos and agrarian settlements in order to control the Southern Plains. Thereafter, all group interactions and adaptive strategies focused on access to the Southern Plains because the economic focus centered on the buffalo. Buffalo robes and meat were the media of exchange at all levels on the Spanish frontier. Thus the buffalo not only sustained all aspects of frontier life, it allowed them to acquire luxury goods. The Comanches and the Apaches fought to control the buffalo range. Because they were adapted to the riverine plains and mountains as well as the buffalo range, the Southern Apaches moved to these regions and continued farming, hunting and gathering until the 1830s. Most important, they were not denied access to the buffalo until the nineteenth century. Starting in 1830 the combined pressures of the Mexican military, Anglo scalp hunters and the Comanches forced Apache populations to concentrate in the mountains, reducing game and plant resources to the point that raiding became an economic activity.

The Spaniards and Pueblos were forced to rely on trade for buffalo robes and meat during the eighteenth century. However, after the Comanche Peace both hunters and traders went to the plains to procure meat and robes. New Mexican ciboleros were joined by Mexican ciboleros and Anglo hunters. Under the impact of so many hunters, the buffalo herds began to dwindle. Hunters were on the plains in both spring and fall, killing calves and females to the point that the herds could not regenerate.

When the buffalo herds started declining and after they were gone, cattle, mules, and horses replaced the buffalo as food and trade items. Comancheros became the middle men in the stolen livestock trade network. Raiding allowed the Comanches to remain nomadic, and while New Mexico was under Mexican control it was a very good adaptive strategy. However, when the Americans expanded into New Mexico and Texas, the Indians faced a very different foe. Indian raids on American herds focused attention first on the Comancheros and then the Indians. The Anglo economy was based on ranching, farming and mining. In Anglo eyes, the buffalo and the Indians were obstacles to progress. Unlike the Spanish and Mexican military, the American army had unlimited resources. The United States was ready to expand into the West; thus, its entire population and economic resources were available to open the West to American settlers.

Four factors, the environment, Apaches, American cattlemen and the adaptive strategies developed by Hispanos in northern New Mexico combined to prevent Hispano settlement below the Hondo Valley in 1870. Throughout the colonial period, New Mexico simply lacked the military resources needed to

colonial period, New Mexico simply lacked the military resources needed to control the region. The New Mexican frontier was chronically short of arms and ammunition until the advent of American traders. Its militia was always undermanned, and the region was underpopulated in general. After 1848, population increase and American movement into the territory led many Hispanos to settle in the Ruidoso and Hondo river valleys. The Seven Rivers Valley was the last stronghold of the Apaches and had been their province since at least 1580. Rocky Arroyo, a main Apache artery, led straight from the Guadalupe Mountains into the Seven River Valley. It was the Apaches' favorite route for stealing John Chisum's livestock. By the time the Apaches were sufficiently subdued, American cattlemen controlled both the land and water.

American cattlemen opened up the lower Pecos River for later settlers. They settled along the Pecos because of the rich grasslands and the proximity to forts and Indian reservations. The environment remained fairly unchanged from Spanish contact to Anglo settlement. There were severe droughts throughout the period but the underground water supply and vegetative cover were able to recover when rainfall levels were adequate. A combination of overgrazing and the uncontrolled drilling of artesian wells reduced the environment to the point that after severe droughts there was no recovery. The introduction of wells and irrigation depleted the underground water supply in the entire region, drying up springs and rivers. Livestock raising was not feasible on the Llano until deep well drilling provided surface water. Even then the region was not capable of supporting large herds concentrated in one area, as demonstrated by the present condition of the area. Mining provided a new economic avenue, but it affected the scanty water resources of the Llano as well as irrigation farming on the Pecos River. Economic development after 1870 produced short term profits but in the long term changed the environment and destroyed more than it produced.

8.8 HISTORICAL PERIOD USE OF THE CARLSBAD AREA

Documents reflect varied utilization of the Carlsbad area for the past 400 years. Land use has ranged from regular use by mobile or partially mobile groups at first European contact in 1582 to intensive mining, ranching and other commercial activities by sedentary groups in the twentieth century. The available documents vary considerably in quality, with descriptive data generally not sufficiently precise to pinpoint site location until the second half of the nineteenth century. The early documents do, however, suggest general patterns of land use even though specific locations cannot be identified.

The Espejo and Sosa expeditions of 1582 and 1590 reported rich salt beds and three different site types: a large, recently deserted rancheria somewhere near Roswell, a large corral on the east side of the Pecos River, possibly used for buffalo capture, and numerous deserted rancherias at other locations along the Pecos River.

The San Saba accounts of 1763 record, at approximately 200 miles southeast of Pecos Pueblo, a large Lipan Apache rancheria with 300 warriors. This site, while not necessarily the same as that reported 180 years earlier by Espejo and Sosa, does demonstrate the continuing importance of aggregation

either at some point in the seasonal round or at least during extraordinary occurrences such as Spanish incursions into the area. At a distance of three days' travel from the large rancharia was a Mescalero rancharia in Los Medanos and, 9 km (5.6 mi or 2 leagues) farther, a Lipan village. While the documentary "Los Medanos" does not necessarily represent the dunes by that same name on the James Ranch, which were caused by critical overgrazing in the area during the present century, the San Saba accounts do suggest a lack of territorial exclusiveness among Apache groups during the middle eighteenth century.

Small settlements in the Hondo, Ruidoso, and Bonito valleys such as Las Chozas, La Junta, Berrendo, El Rependente, and La Boquia are mentioned but not described by American settlers in the 1850s. These locations may have been partially settled by Mexican ciboleros who traveled along the Pecos River on the way to the buffalo plains. Comanchero trails during the same period also ran along the Pecos River. Groups participating in the trade included Mescaleros, Kiowas, Comanches, and Lipan and Mogollon Apaches. Contemporary accounts report as many as 13 discrete parallel paths along the river.

Early settlements by New Mexican Hispanos in drainages near the project area include La Placita (Lincoln) on the Bonito River, founded in 1849, and La Plaza de San Jose or Missouri Plaza, founded in the mid-1860s.

Anglo settlements in the area include Fort Stanton in 1855. The Mescalero Apaches were placed on the Bosque Redondo Reservation in the 1860s; the area's cattle industry developed in order to supply the forts and reservations. Cow camps and ranches were established along the Pecos and Black rivers in the late 1860s. Businesses supplying the cow camps grew until the cattle industry began declining from overgrazing in the 1880s.

While early Anglo ranching-related settlement was restricted to the Pecos River until the introduction of deep well drilling and windmills, springs and wells away from the river were frequently used and were surrounded by many trails. Important springs included Dug Springs and Monument Springs. Dam and irrigation works began on the Pecos in the 1880s with the decline of the cattle industry and led to its replacement by irrigation farming and the growth of farming communities such as Loving and Malaga. Ranching moved to the Llano Estacado at the same time and the Nash Ranch and James Ranch were established shortly before the turn of the century.

Informants' accounts reflect severe overgrazing in the area. They report a predominance of grass and a relative scarcity of mesquite earlier in this century, as well as greater faunal diversity. Overgrazing on the James Ranch was so serious that the Bureau of Land Management had to remove many of the cattle and the extent of Los Medanos was greatly increased. In addition to the James Ranch, Morgan Livingston also owned land near the project area; he had buildings at the J Bar F Well, Twin Wells, and the present location of the Kenny Smith Ranch. The potash mining and the Salt Lake's increased size and salinity have led to the contamination of many wells and deterioration in farming operations such as Harroun Farms. The associated company town, Chili, was abandoned after the firm went bankrupt.

Mexican-Americans settled in the area in the late 1880s and early 1890s, founding towns such as Eddy, Phoenix, San Jose, Look Out, and Little Cuba. Homesteading occurred from the 1870s until at least the 1930s, but in many cases homesteaders were not able to compete successfully with the large ranches because of insufficient capital to develop water resources. Much commercial activity in recent years has related to supplying the potash mines and the miners. Mining activity, very slow in recent years, has contributed to further deterioration in the area's water resources.

8.9 EVALUATION OF HISTORICAL SITES LOCATED IN DOCUMENTS

Historical period sites identified in documents of the Carlsbad area can be evaluated on the basis of their research potential. A major distinction between early and late historical period land use involves high mobility during the early period and increasing sedentism up to the present day, especially beginning in the late 1880s, when the cattle industry began to decline.

The Carlsbad area has been used by seasonally mobile people from earliest contact in 1582 until some 300 years later when the population began diversifying into supplying the cattle ranches and into nonherding-related pursuits. Sites noted during the sixteenth century include native rancherias and corrals. The corrals reflect local hunting activities and the deserted rancherias reflect fall hunting activities on the plains.

The next site-specific accounts date from the eighteenth century and record two Lipan rancherias, one large, and one Mescalero rancheria in the project area. The large rancheria with 300 warriors indicates aggregation at some point during the annual round; the aggregation could, however, be related to the Spaniards' presence. The Lipan and Mescalero Apaches both used the area, and documents describe a rancheria in Los Medanos, is probably the Mescalero Sands (Figure 2.1).

The sixteenth and eighteenth century records describe native sites in the area resulting from mobile subsistence systems. These sites are important because of the relative lack of relevant historical and archaeological information from this time period. While the rancheria site locations were obvious to Spanish observers, housing materials were probably not substantial and archaeological visibility at present may be low, especially given the unstable nature of the dune substrate. Deposition may have been substantial during periods of aggregation, but preservation was probably not good. Potential for significance would be high if these sites could be identified, dated, and if their contents are reasonably intact.

Nineteenth century sites in southeastern New Mexico outside the WIPP area include small towns, Anglo forts, Apache reservations, cow camps, ranches, wells, springs, dams, irrigation construction, and homesteads. Town populations included ciboleros, Comancheros, cowboys, soldiers, construction workers, and individuals supplying goods or services to these groups. Until the decline of the cattle industry and the beginning of farming activity, many of these sites involved seasonal or occasional mobility. The cow camps were abandoned for the annual cattle drives and the towns were often occupied by

traders or hunters who were gone during certain times of the year. The irrigation and dam construction, which required intensive construction activity and more or less year-round maintenance, and the wells and springs represent two different types of water resource. The wells and springs, as valuable water resources, represent probably continually used points in the landscape. The nineteenth century sites, many of which were abandoned before the turn of the century, are expected to feature fairly intact deposition, as evidenced by excavations at San Jose, and good archaeological visibility. As many sites were located with respect to water sources, repeated occupations near the water are expected to have produced a very complex archaeological record. The springs, which are often surrounded by trails, are expected to exhibit extremely long term use and complexity probably comparable to that at Hill Tank. Research potential at the sites from this time period is good given the possibility of oral, written, and photographic documentation.

Finally, potash mining, herding and farming activities and businesses that serve these industries are the primary sites generated in the area today. The towns where the workers live are the most complex sites in the area. Herding activities are very similar to those in the nineteenth century. Mining activities on the other hand, create spatially extensive and often complex sites. Research potential for twentieth century sites is expected to be good because of extensive documentation and good deposition, but many of the town and mining sites are still in use and pose problems because of their complexity.

9.0 SUMMARY AND DISCUSSION

9.1 SUMMARY

Forty new sites were encountered during the Class II inventory of the WIPP zones III-V. Of these, only one, LA 54369, may pertain to previously reported materials; it may constitute an extension of LA 16632 or an intermediate locus connecting LA 16632 with LA 16634 (Schermer 1978). The bulk of the sites encountered lay in or atop ridgeline dunes either stabilized (Figure 9.1) or with active blowouts (Figure 9.2) and on low rises overlooking playas (Figure 9.3); both sites and isolates were rare in areas of low relief.

Sites in the WIPP area tend to lack evident or intact features; definable feature types are generally limited to lithic concentrations, grinding loci, ash lenses and thermofact concentrations. Occasional stacks of burned caliche (Figure 9.4) may represent either partly deflated roasting pit fill, pit hearths, or surface hearths; the examples tested all proved to be so deflated as to have lost charcoal associations. Fire pits or hearths without stone lining or thermofact associations are also present in several sites; two of these were excavated at site LA 54388, a probably intact single-component Mogollon site which proved to be relatively rich in ceramics but almost entirely lacking in chipped stone and thermofacts.

Structures were not definitely encountered on this project. A series of alignments at LA 54361 may be geofactual; they present a range of circular, polygonal, and rectangular alignments lying on caliche caprock. A series of linked and partly stacked rectangular alignments tested at LA 54363 proved to lie partly in contact with bedrock and partly over a complex midden deposit; they may represent a deflated prehistoric structure, a tent base, or an unusual product of bedrock weathering and rill detritus. An additional alignment was encountered just outside the survey area at LA 16633, first reported by Schermer (1978). It is composed of thermofacts and burned groundstone pieces on dune sand; it is probably structural.

Considering the wide range of Middle Archaic to Middle Ceramic diagnostics encountered on the WIPP sites, the lithic assemblages monitored were surprisingly invariant. Most exhibit evidence of tool manufacture and use, most have some "Archaic" groundstone, and most display curated cobble core reduction episodes resulting in typical secondary debitage. The exceptions fall into four categories: an assemblage with a substantial biface, uniface, and tool component associated with bipolar pebble reduction and no diagnostics (LA 54392); a site characterized by very large, thin biface flakes associated with mineralized bone and very old paleosol (LA 54389); an assemblage characterized by association of mineralized bone with large short, wide flakes and a hearth, intruded into an old paleosol (LA 54385), and a small assemblage which produced the bulk of all utilized cores/core tools in the survey (LA 54381).

Overall patterns in lithic assemblage composition are difficult to characterize due to the small item population size typical of most sites. However, several patterns seem to be present. Smaller sites tend to

AD-A194 015

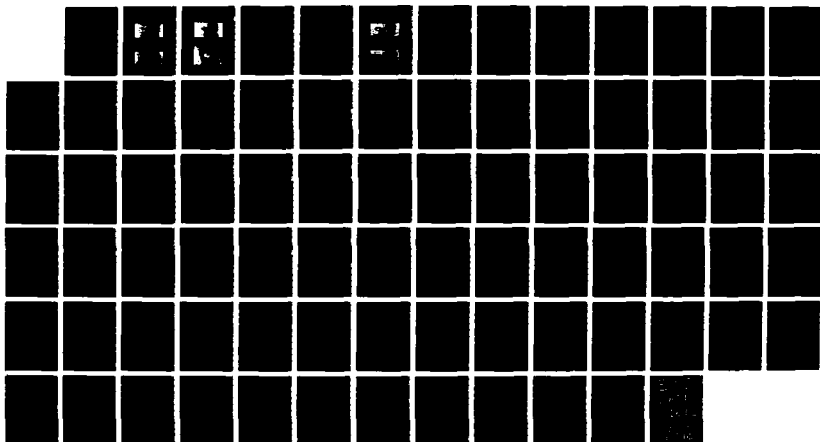
REPORT OF CLASS II SURVEY AND TESTING OF CULTURAL
RESOURCES AT THE WIPP (U) MARIAH ASSOCIATES INC
ALBUQUERQUE NM J C ACKLEN ET AL. MAY 87

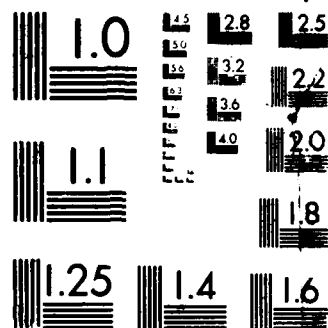
3/3

UNCLASSIFIED

F/G 5/6

NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A



Figure 9.1 LA 54384, Located on a Stabilized Dune Ridge (photo), WIPP Assessment Study, ACOE, 1986.

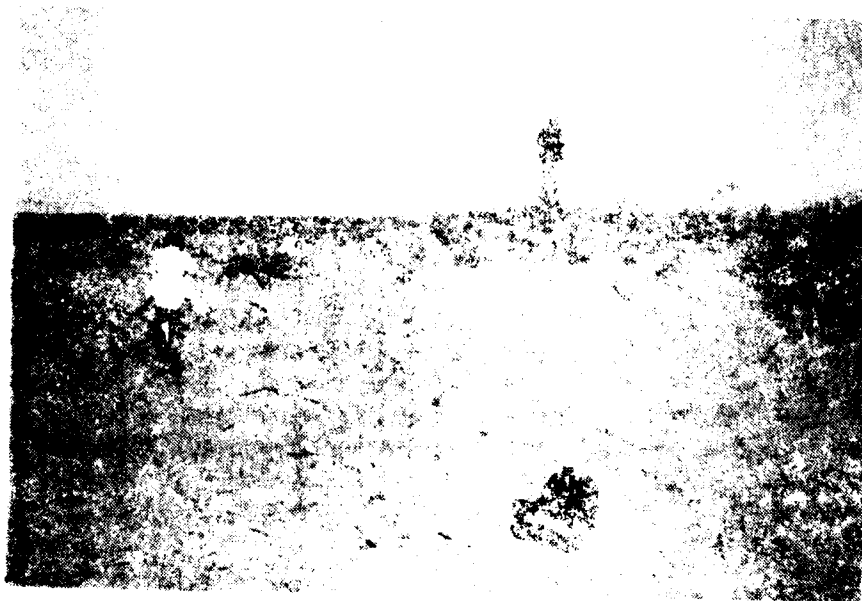


Figure 9.2 LA 54378, Located in an Active Blowout on a Dune Ridge (photo), WIPP Assessment Study, ACOE, 1986.



Figure 9.3 LA 54373, Located on a Low Rise Overlooking a Playa, WIPP Assessment Study, ACOE, 1986.



Figure 9.4 Stacked Rock Hearth, LA 54364 (photo), WIPP Assessment Study, ACOE, 1986.

exhibit higher formal tool relative frequencies than do larger sites. Sites with high absolute artifact frequencies exhibit a tendency to have relatively more groundstone, thermofactual debris, and debitage, but relatively less formal chipped stone than do small sites. These larger sites tend to occur in dunes capping bedrock ridges near water or in other prominent overlooks; they may exhibit higher frequencies of finished (i.e., painted or slipped) ceramics. The large sites near Hill Tank (LA 5463, LA 54368, and LA 54390) certainly have experienced extensive artifact collection, which may have contributed to the observed pattern. However, the very small assemblages from small sites may exaggerate the importance of formal tools; on large sites chipped stone debitage occurs in greater frequencies than on small sites and contributes to a lower proportion of formal tools even though the latter are present. Smaller sites often consist only of a formal tool production/repair locus, of a milling station with thermofacts, or a camp with pottery, hearths, and groundstone but with little or no chipped stone or thermofacts (LA 54388).

The WIPP ceramics indicate the following distribution of types. Included among the plainwares were Ochoa Brown Indented, South Pecos Brown and a possible redwashed brownware sherds; no Middle Pecos Micaceous wares were located. The two most frequently occurring types were El Paso Brown and Jornada Brown. Most common painted wares were Chupadero Black-on-white and El Paso Polychrome. Another painted ware occurring in small frequency was redwares and Three Rivers Red-on-terracotta.

Additional ceramic patterns are the paucity of ceramics and of pot drops. The only sizeable ceramic assemblage occurred at LA 54363, which experienced intense usage, especially as a base camp. On other sites, the number of sherds was less than 10. This pattern may indicate primarily logistical use of the area, involving little transport of ceramics except at base camps near Hill Tank. The rarity of sherd refits indicates that either pot drops occurred infrequently or that postdepositional processes have scattered the sherds comprising pot drops.

Testing at WIPP indicated that LA 54388 was, as expected, an intact site with chronometric potential and substantial buried deposits of an undeflated character. Site LA 54363 proved to contain massive and extensive buried cultural deposits, as was also expected. Unexpectedly, site LA 54366 proved also to contain substantial cultural deposition within relict dune pediments. Other sites tested yielded no additional evidence of substantial intact deposits; it should be emphasized that only two of these (LA 54389 and LA 54390) are, due to deflation, judged to have no further potential. Several untested sites evidence exceptional depositional and chronometric potential; foremost of these are LA 54362, not tested because of its complexity, and the Zone V site, LA 54392, untested because testing was restricted by contract to Zones III and IV. Site LA 54362 closely resembles the much larger LA 54368 in setting, while LA 54392 may represent a less complex and hence more manageable manifestation of the same settlement dynamics responsible for the similarly situated but much larger and complex site LA 54363.

The archaeological interview phase of this project was unsuccessful in achieving its original goal - the documentation of diagnostics removed from project sites by collectors. This unachieved goal was much more than offset

by two accomplishments of the interview phase: an inventory of the relative abundance of diagnostics from various time periods represented in the study region, and an assessment of the interaction of amateur collection, climatic shifts, grazing, and vegetational change in southeastern New Mexico.

Collections examined and the recollections of the avocational archaeologists indicate that the region is characterized by a relatively low frequency of unfluted lanceolate points (Plano PaleoIndian and Early to Middle Archaic), higher frequencies of fluted and "fluted-like" (e.g., Midland, large Plainview) PaleoIndian points, moderate frequencies of side-notched arrow points, and high frequencies of the palmate, corner-notched dart and arrow points thought to be indicative of the Late Archaic and Early Ceramic periods.

Ceramics observed or reported by informants tended to be dominated by plain Mogollon brownwares with few tooled or indented pieces; of the decorated Casas Grandes/Mogollon/Puebloan forms, only Chupadero B/W appears to be common in the region. No Woodland/Canark cordmarked or other paddle and anvil pottery was seen, although sites immediately east of the Llano Estacado exhibit these types almost exclusively.

Historical study failed to locate potentially significant early sites within the project area; more recent sites may be limited to the complex associated with the James Ranch. Early historical occupation of the area seems to have been dominated by relatively mobile, semihorticultural groups reminiscent of the Mesilla Phase Mogollon; these groups evolved into or were replaced by mounted trader-raider-hunters of varied ethnicity who continued to travel through or otherwise exploit the area until its occupation by Europeans in the middle nineteenth century. Thereafter, use of the project area seems to have been limited to the mining-ranching complex still characteristic of the region.

9.2 DISCUSSION

It is difficult to interpret much of the data acquired in this project. Nevertheless, several important trends have been recognized and merit comment.

At the level of site recognition and characterization, a variety of influences tend to obscure patterning in cultural resources. Foremost among these are mineral exploitation, grazing, amateur collection, and perhaps vegetation control programs.

Grazing in the area has had several immediate consequences. Vegetation patterns have changed, soils have been destabilized, and the erosional regime has been altered within the last century (Figure 9.5). The requirement of cattle for water and of ranchers for access to cattle and cattle-watering stations has ensured that natural lakes and springs have been modified by tank construction and massive local erosion due to cattle trails and trampling. For example, the Los Medanos dune field is reported to have expanded because of over-grazing (Figure 9.6). The propensity of cattle to lounge in ridge top areas near water has ensured the heavy deflation of just those locations which appear to contain the bulk of cultural resources relating to base camp activities. The need for roads accessing watering areas has ensured easy

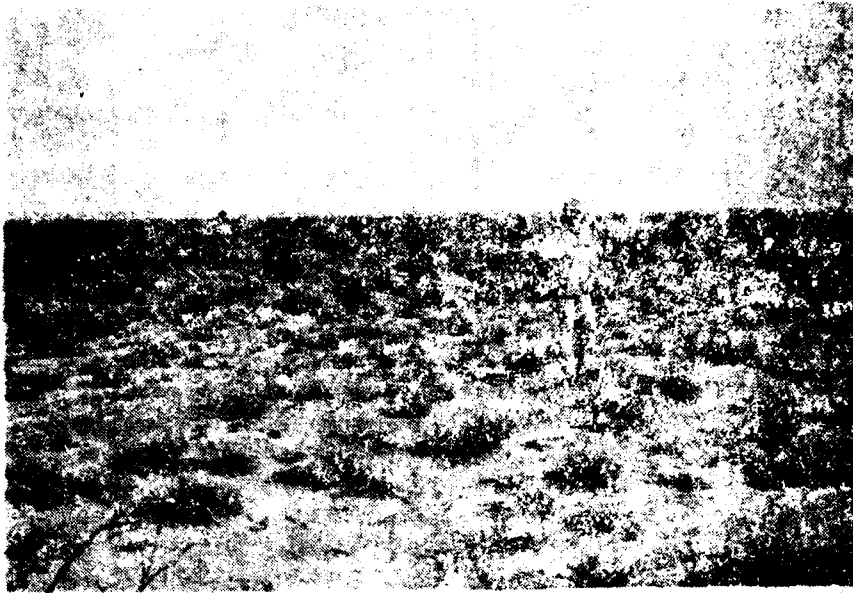


Figure 9.5 LA 54376, Undergoing Erosion from Small Washes, WIPP Assessment Study, ACOE, 1986.



Figure 9.6 The Los Medanos Dune Field, WIPP Assessment Study, ACOE, 1986.

access by collectors to those same cultural resources, with resulting massive loss of diagnostics and exotics from base camp loci all over the region.

The construction of pipeline roads has opened access to much otherwise inaccessible terrain. Where pipeline roads cross or pass near ridges, archaeological sites have been directly disrupted; the easy access provided by road construction has ensured that all nearby topographic prominences are available as amateur collection loci. Most promising locations near roads have been repeatedly collected. Modern collectors universally acknowledge the increasing scarcity of arrowheads; many have even begun to collect undecorated sherds, groundstone fragments, cores, and debitage.

Vegetation control programs in the northeastern WIPP area may have had a somewhat different impact on cultural resources. Areas recently subjected to spraying for shin oak control (clearly visible on aerial photographs) exhibit a lack of deep blowouts, a striking vegetational dominance by various (otherwise rather rare) grasses, legumes and burrs, and a generally ubiquitous mobile Aeolian cap some 10-20 cm in depth. Virtually no cultural resources were encountered in such areas; it is possible that none were ever present, but more likely that resources were simply buried.

Lithic assemblages in the project area, and in the region in general, are heavily dominated by forms generally considered to be diagnostic of the Late Archaic and Early Ceramic periods, i.e., corner-notched large and small points, one-hand manos, and slab/basin metates. It is likely that most of the sites recorded in this project pertain to this time period, at least in part. Not only do Late Archaic period and Early Ceramic period lithic forms tend to cooccur, but it is striking that Late Archaic forms commonly co-occur with ceramics.

The implications of these statistically weak observations remain striking, albeit less than completely clear. Either no substantial differences existed between Late Archaic and Early Ceramic site location strategies, adaptations, and technologies, or Early Ceramic occupants collected or continued to make dart points for a long time after their use was largely abandoned by the Jornada Mogollon, or ceramics were adopted and used in the area very early (in the local equivalent of the Initial Early Mesilla Phase), or Late Archaic/Early Ceramic occupation of the region was much more intensive than that of other periods, resulting in a complex of large and small site palimpsests dominated by elements contributed during the Late Archaic and Early Ceramic periods. Of course, these interpretations are not mutually exclusive; all the suggested processes may have operated on the static record we perceive. It is clear that lanceolate points, especially unfluted Plano PaleoIndian and earlier Archaic styles, are very rare in the project area and in the region as a whole, as are true side-notched and other arrow points thought to be diagnostic of the Middle Ceramic and Late Ceramic Protohistoric periods.

Externally based typologies could be inappropriate to the area; palmate corner-notched Early Archaic point styles are thereby implied, as is numerical dominance of corner-notched over side-notched arrow points after A.D. 900. More plausible is the strong inference that most of the area's archaeology

pertains to the time period 1000 B.C. to A.D. 900 or else the weaker inference that activities occurring prior to or subsequent to this period tended not to entail the use, transport, loss, manufacture, or repair of projectile points, which were found on 30% of WIPP sites. Clearly, only systematic and extensive absolute dating of occupational units, whether or not they have diagnostic associations, will provide the data corpus required to resolve these questions.

Ceramic patterns observed in this study suggest two speculations. First, ceramics were probably never a central element in local subsistence technology; sherds were found on 40% of WIPP sites and never in large quantities. This pattern may have been affected by amateur collection. Secondly, pot sherds may have been of substantial importance, perhaps as containers or comales. Unless sherds had been routinely scavenged from breakage sites, one would anticipate encountering more sherd refits than were seen. It seems improbable that natural scattering can account for the frequency of "one sherd per vessel" observations and for the failure of this project to record even one clear potdrop.

The rarity of structural features in the region merits some comment. Most shelters probably were of the wikiup or Early Mesilla "not really a pithouse" type, based on entrads accounts and Jornada Mogollon and Apache analogies, although deep pithouses occur east of the WIPP area. Such structures would be manifest locally as ephemeral alignments of cobbles, most of which were used to tamp or brace brush elements thrust into sandy substrates. As these structures flexed in winds, branches would tend to become unseated, requiring that rocks be packed around their bases to maintain support. In intensely reoccupied sites, many of the rocks selected would be recycled thermofacts or unused or broken groundstone items. Postholes would rarely be well-preserved; interior features might be restricted to vague saucer-shaped ash or microdebitage scatters, or gaps in otherwise continuous external scatters. Special microexcavation and recovery techniques may be required to assess adequately the cultural nature of such ephemeral features; expectations drawn from excavation of highland Mogollon or Anasazi architecture are clearly not applicable in the sandy, timberless eastern New Mexican plains.

The model which eventually emerges from the present WIPP-area study and other ongoing research in southeastern New Mexico is difficult to foreshadow; general interest in study of the region is only just developing. It may, however, be possible to anticipate certain aspects of that model from the perspective of the WIPP data.

The remarkable lack of "un-Mogollon" diagnostics in southeastern New Mexico has long been recognized. However, the presumed contrast between the Mogollon and the inhabitants of southeastern New Mexico has been traditionally exaggerated by a perception of the Mogollon based primarily on Montane Mogollon and Mimbres Valley sites. As our understanding of the Jornada Mogollon increases, we see that the Jornada and Jornada Eastern Extension are not greatly different in technology, environment, or style. Moreover, new studies such as that of Lekson (1984), who suggests that even the Classic Mimbrenos may have been less than fully sedentary and not entirely

agricultural in orientation, tend to minimize the intensity of perceived distinctions between even the Montane Mogollon and the Eastern Extension inhabitants. It is probably appropriate to remodel the Mogollon and their Late Archaic forebearers as mobile, ceramic-using, seminorticultural folk, some of whom regularly exploited the eastern New Mexico plains. The unity of style and technology across southern New Mexico, together with the absence of clearly Woodland or Plains materials in southeastern New Mexican assemblages, suggests that future research might profitably be directed toward explicating the role of the southeastern New Mexican plains within Jornada subsistence and society.

10.0 MANAGEMENT RECOMMENDATIONS

10.1 PROBABLE IMPACTS

Present and potential adverse impacts on archaeological resources recorded in the present study are both direct and indirect. Direct impacts of the WIPP Project include road traffic, drilling activity, and potential road construction. Indirect effects include increased access and visitation, resulting in grazing and cattle trampling, amateur collection, vandalism, water erosion, recreational use, and vehicular traffic. Impacts noted during the present study are wind and water erosion and colluviation, some of it related to road traffic, as well as grazing and trampling by cattle, especially near watering and lounging points.

Probable future impacts on each site are tabulated in Table 10.1. The impact analysis assumes that wind erosion is a constant factor in dune/blowout situations and that amateur collection is greatest near roads, drill pads, pipeline rights-of-way, and on prominent, easily visible dune ridges and knolls. All sites encountered are subject to at least one adverse effect, and most sites are subject to several. As nearly all sites were recorded in dune/blowout situations, effects of wind erosion constitute a primary consideration in determining depositional integrity and potential for each site. Geomorphological factors taken into account are depth of blowout, nature and depth of surrounding blowouts, levels at which artifacts occur in blowouts, and relationship of artifacts to paleosols or stable soil surfaces, if present.

10.2 PROTECTIVE MEASURES

In nearly all cases, the primary protective measure recommended is avoidance of sites. In addition, for two large sites, LA 54363 and LA 54368, detailed mapping is suggested as an aid to monitoring site condition. For sites where survey data were insufficient for determining eligibility for the National Register of Historic Places (36 CFR 60), further testing for eligibility is recommended. Sites LA 54389 and LA 54390, where site deposit integrity is judged to be less than 10%, require no further work as these sites are deemed ineligible for the National Register. Mapping is recommended for LA 54369 to determine its degree of spatial continuity with ENM 10407 and ENM 10409. Finally, full data recovery is recommended for LA 54388, an apparently intact Mogollon camp, since the hearths are presently being rapidly exposed and the site is subject to exceptionally severe impacts from cattle trampling due to its proximity to a well and stock-watering tank.

10.3 ELIGIBILITY OF IDENTIFIED CULTURAL RESOURCES

Of the 40 archaeological sites identified in the present study, 14 are considered eligible for inclusion in the National Register of Historic Places, all under criterion (d) in Section 60.4 of the National Historic Preservation Act. Two sites are considered ineligible because of insufficient site integrity. The remaining 24 sites have insufficient data at present for making a decision on eligibility.

Table 10.1 Site Type, Integrity, and Significance, WIPP Assessment Study, ACOF, 1986.

| LA # | MA# | Site Type | Integrity* | Probable Impacts | Recommended Eligibility for NRHP | Eligibility Criterion | Recommended Next-Stage Treatment |
|-------|--------|---|-------------|--|----------------------------------|-----------------------|--|
| 54357 | 235B-1 | Middle Archaic & Mogollon camp processing area | >50% intact | wind erosion grazing | insufficient data | --- | testing for eligibility avoidance |
| 54358 | 235B-2 | Mogollon camp food processing lithic reduction | ? 1/ | amateur collection wind erosion grazing | insufficient data | --- | avoidance testing for eligibility |
| 54359 | 235B-3 | Mogollon camp | 50 - 75% | grazing wind erosion | eligible | 60.4d | avoidance |
| 54360 | 235B-4 | Mogollon camp | 25% | grazing wind erosion amateur collection | insufficient data | --- | avoidance, testing for eligibility |
| 54361 | 235B-5 | Mogollon camp lithic reduction, Possible structures | 75% | wind erosion water erosion amateur collection grazing | insufficient data | --- | avoidance, testing for eligibility, Possible structural alignments should be examined by a geologist |
| 54362 | 235B-6 | Mogollon camp | 80% | grazing wind erosion amateur collection | eligible | 60.4d | avoidance |
| 54363 | 235B-7 | Multicomponent habitation | 65% | grazing amateur collection wind erosion water erosion recreational use road traffic | eligible | 60.4d | avoidance & detailed mapping |
| 54364 | 235B-8 | Mogollon camp | 25% | grazing wind erosion water erosion | eligible | 60.4d | avoidance |
| 54365 | 235B-9 | camp | ?_1/ | grazing wind erosion water erosion | insufficient data | --- | testing for eligibility avoidance |

Table 10.1 (continued)

| LA # | MA# | Site Type | Integrity* | Probable Impacts | Recommended Eligibility for NRHP | Eligibility Criterion | Next-Stage Treatment |
|-------|---------|---|-------------------------|--|----------------------------------|-----------------------|---|
| 54357 | 235B-1 | Middle Archaic | >50% | wind erosion | insufficient | --- | testing for |
| 54366 | 235B-10 | Middle-Late Archaic camp/ early 20th century activity area | 50% | pipeline right-of-way, road traffic amateur collection | eligible | --- | avoidance |
| 54367 | 235B-11 | Mogollon camp/ acorn milling station | high 1/ | grazing wind erosion | insufficient data | --- | testing for eligibility avoidance |
| 54368 | 235-12 | Middle Archaic & Mogollon Habitation/camp | 70% | recreational use road traffic grazing wind erosion water erosion amateur collection | eligible | 60.4d | avoidance detailed mapping |
| 54369 | 235B-13 | Mogollon camp | 90% | grazing wind erosion amateur collection | eligible | 60.4d | mapping to determine continuity w/ENM |
| 54370 | 235B-14 | camp/milling station | >50% | intensive grazing | insufficient data | --- | avoidance testing for eligibility |
| 54371 | 235B-15 | milling station/ camp | Impossible to assess | intensive grazing & cattle stomping | insufficient data | --- | testing for eligibility |
| 54372 | 235B-16 | camp | 50% | wind erosion water erosion grazing | insufficient data | --- | testing for eligibility |
| 54373 | 235B-17 | Late Archaic & Mogollon camp | 30% | wind erosion water erosion grazing | eligible | 60.4d | avoidance |
| 54374 | 235B-18 | Early Ceramic camp/milling station | 50% | wind erosion water erosion grazing cattle trampling | eligible | 60.4d | avoidance |

Table 10.1 (continued)

| LA # | NA# | Site Type | Integrity* | Probable Impacts | Recommended Eligibility for NRHP | Eligibility Criterion | Next-Stage Treatment |
|-------|---------|--|-------------------------|---|----------------------------------|-----------------------|---|
| 54357 | 235B-1 | Middle Archaic | >50% | wind erosion | insufficient | --- | testing for |
| 54375 | 235B-19 | Mogollon multi-component camp | 70 - 80% | wind erosion water erosion grazing cattle trampling amateur collection | eligible | 60.4d | avoidance |
| 54376 | 235B-20 | Mogollon milling station/camp | potentially high_1/ | road traffic amateur collection | insufficient data | --- | testing for eligibility |
| 54377 | 235B-21 | camp/milling station | 60% | grazing wind erosion | insufficient data | --- | testing for eligibility |
| 54378 | 235B-22 | overlook/camp | >=50%? | amateur collection wind erosion water erosion grazing | insufficient data | --- | testing for eligibility |
| 54379 | 235B-23 | overlook/camp | >=50% | wind erosion water erosion grazing amateur collection | insufficient data | --- | testing for eligibility |
| 54380 | 235B-24 | Middle Archaic overlook/camp | 75% | road traffic amateur collection wind erosion water erosion grazing drilling activity | insufficient data | --- | further testing eligibility avoidance |
| 54381 | 235B-25 | Middle-Late Archaic camp/ milling station | 50% | water erosion wind erosion grazing | eligible | --- | avoidance |
| 54382 | 235B-26 | camp | impossible to assess 1/ | road traffic amateur collection wind erosion grazing | insufficient data | --- | further testing for eligibility |
| 54383 | 235B-27 | camp | impossible to assess 1/ | water erosion | insufficient data | --- | testing for eligibility |

Table 10.1 (continued)

| LA # | MA# | Site Type | Integrity* | Probable Impacts | Recommended Eligibility for NRHP | Eligibility Criterion | Next-Stage Treatment |
|-------|---------|---|-------------------------|--|----------------------------------|-----------------------|-------------------------|
| 54357 | 235B-1 | Middle Archaic | >50% | wind erosion | insufficient | --- | testing for |
| 54384 | 235B-28 | camp | impossible to assess 1/ | | insufficient data | --- | testing for eligibility |
| 54385 | 235B-29 | PaleoIndian camp | 30% | water erosion wind erosion grazing | eligible | 60.4d | avoidance |
| 54386 | 235B-30 | camp | impossible to assess 1/ | wind erosion grazing | insufficient data | --- | testing for eligibility |
| 54387 | 235B-31 | Late Archaic/ Early Ceramic camp | impossible to assess 1/ | water erosion | insufficient data | --- | testing for eligibility |
| 54388 | 235B-32 | Mogollon possible single component camp | 100%? | wind erosion grazing severe cattle trampling | eligible | 60.4d | full data recovery |
| 54389 | 235B-33 | PaleoIndian/ Archaic camp | 5% | road traffic water erosion wind erosion grazing amateur collection | ineligible | --- | no further work |
| 54390 | 235B-34 | Mogollon camp | very low 1/ | water erosion amateur collection | probably ineligible | --- | no further work |
| 54391 | 235B-35 | camp/ overlook | >=50%? | road traffic amateur collection | insufficient data | --- | testing for eligibility |
| 54392 | 235B-36 | camp/ overlook | >=50% | road traffic amateur collection | insufficient data | --- | testing for eligibility |
| 54393 | 235B-37 | camp | 80% | wind erosion water erosion grazing | insufficient data | --- | testing for eligibility |
| 54394 | 235B-38 | Mogollon camp/ overlook-long term or multi-purpose | 75% | wind erosion grazing amateur collection | eligible | 60.4d | avoidance |

Table 10.1 (continued)

| LA # | MA# | Site Type | Integrity* | Probable Impacts | Recommended Eligibility for NRHP | Eligibility Criterion | Next-Stage Treatment |
|-------|---------|----------------|----------------------|-------------------------|----------------------------------|-----------------------|-------------------------|
| 54357 | 235B-1 | Middle Archaic | >50% | wind erosion | insufficient | --- | testing for |
| 54395 | 235B-39 | camp | probably high 1/ | wind erosion grazing | insufficient data | --- | testing for eligibility |
| 54396 | 235B-40 | camp | impossible assess 1/ | wind erosion grazing | insufficient data | --- | testing for eligibility |

* Rough estimate based on depth of blowouts, level at which artifacts occur, depth of likely cultural deposition.

1/ Impossible to assess, only blowout in area or all blowouts very shallow.

The two noneligible sites are a PaleoIndian/Archaic and a Mogollon camp. The 14 eligible sites include Archaic and Mogollon camp/overlook/milling station sites, a possible PaleoIndian or earlier Archaic camp, multicomponent habitations and a possible single component Mogollon camp. The camp/overlook/milling station sites are judged eligible because of demonstrable cultural deposition, indicating their potential to yield information important to prehistory (36 CFR Section 60.4d). The multicomponent sites are thought eligible on the grounds of richness of assemblage, depth of deposition, and long span of occupation. The possible single component Mogollon site is judged eligible on the grounds of potential for contributing to development of a ceramic period chronology for southeastern New Mexico. All other sites documented in this study are thought to be potentially eligible, but require evaluation to determine site integrity and deposition.

10.4 RESOURCE POTENTIAL FOR DATA RECOVERY

Data potential varies for PaleoIndian, Archaic and Mogollon camps, multicomponent habitations, and the possible single component Mogollon camp. Ranking of significance and potential for future research has been accomplished separately for sites with and those without sufficient data for complete assessment.

10.4.1 Sites with Sufficient Data for Assessment of Potential

These 14 sites considered eligible for inclusion in the National Register range from PaleoIndian to late Mogollon camps and habitations. (Table 10.2)

10.4.1.1 PaleoIndian or Earlier Archaic Sites

LA 54385 is one of the few known sites thought to have potential for containing PaleoIndian or earlier Archaic deposits in the project area. The presence of in situ deposits, combined with the rarity of early sites, makes this resource potentially significant. The site provides potential for assessing intrasite variability in camp activities and for examining lithic technology and reduction sequences. Study of a well dated early lithic assemblage could facilitate developing ways of recognizing temporality in lithic scatters when no diagnostic point types are present. This site has potential for improving a view of early sites that has been influenced by amateur collection of points, geomorphological burial of many very old sites, and the ephemeral nature of most occupations.

10.4.1.2 Archaic Sites

Two Archaic sites appear to be single component on the basis of surface evidence, while three others overlap with Mogollon components. Archaic sites can be difficult to distinguish from Mogollon sites; point types and presence of ceramics have been used to make the distinction in the present study. LA 54366 and LA 54373 have some cultural deposition and are ranked low; LA 54363 and LA 54381 have good cultural deposition and a high rank. All four sites could provide chronometric dates for Archaic and Mogollon occupations in the area through providing cross-dates for time diagnostic artifacts. On the

Table 10.2 Significance and Potential for Future Research, WIPP Assessment Study, ACOE, 1986.

| <u>Sites with Sufficient Data for Assessment of Potential</u> | | |
|---|--------|---|
| Site LA# (MA#)(Period)** | Rank * | Justification |
| LA 54359 (3)(M) | 2 | Good deposition; analytical advantages of small sites |
| LA 54362 (6)(M) LA 54374 (18)(M) | 2 | Good deposition; potential for dating painted ceramics |
| LA 54363 (7)(A-M) | 1 | Good multicomponent deposition; possible presence of structures, which are very rare in the area; potential for cross-dating ceramics and paint types; subject to various impacts |
| LA 54364 (8)(M) | 3 | Analytical advantages of small sites; some deposition |
| LA 54366 (10)(A) | 3 | Some deposition |
| LA 54368 (12)(A-M) | 1 | Good multicomponent deposition; potential for dating ceramics and point types; subject to various impacts |
| LA 54373 (17)(A-M) | 3 | Some deposition; possibly intact hearths for dating ceramics and point types |
| LA 54369 (13)(M) LA 54375 (19)(M) | 1 | Good deposition; large quantities of burned rock suggest potential for dating ceramics and points |
| LA 54381 (25)(A) | 2 | Good deposition |
| LA 54385 (29)(P) | 1 | Some deposition; one of few PaleoIndian sites |
| LA 54388 (32)(M) | 1 | Excellent deposition; potentially single component site; subject to severe impacts |
| LA 54394 (38)(M) | 1 | Good deposition; long term or multipurpose camp; potential for dating ceramics |

Table 10.2 (continued)

| <u>Sites with Sufficient Data for Assessment of Potential</u> | | |
|---|--------|--|
| Site LA# (MA#)(Period)** | Rank * | Justification |
| LA 54357 (1)(A-M) | 3 | Multicomponent sparse scatter |
| LA 54358 (2)(M) | 3 | Deposition likely analytical advantages of small sites |
| LA 54365 (9)(?) | | |
| LA 54371 (15)(?) | 3 | Deposition likely |
| LA 54386 (30)(?) | | |
| LA 54387 (31)(A-M) | | |
| LA 54396 (40)(?) | | |
| LA 54367 (11)(M) | | |
| LA 54360 (4)(M) | 2 | Deposition likely; potential for dating ceramic types |
| LA 54393 (37)(?) | 2 | Good deposition likely; analytical advantages of small site |
| LA 54395 (39)(?) | | |
| LA 54384 (28)(?) | 1 | Possible structure alignment; good deposition |
| LA 54361 (5)(M) | | |
| LA 54370 (14)(?) | 2 | Good deposition likely |
| LA 54376 (20)(M) | | |
| LA 54377 (21)(?) | | |
| LA 54391 (35)(?) | | |
| LA 54372 (16)(?) | 2 | Good deposition likely; possibility of superimposed deposits |
| LA 54378 (22)(?) | 2 | Good deposition likely; under- going aeolian deposition likely |
| LA 54379 (23)(?) | | |
| LA 54382 (26)(?) | | |
| LA 54383 (27)(?) | | |
| LA 54380 (24)(A) | | |
| LA 54392 (36)(?) | 1 | Good deposition likely; pebble bipolar reduction and high quality biface reduction; high frequency of formal tools and utilized flakes |

* 1 = High rank, 3 = Low rank** A = Archaic, M = Mogollon

basis of surface evidence, Archaic and Mogollon site types do not appear to be very different, suggesting that both groups may have exploited at least portions of the project area in similar ways.

10.4.1.3 Mogollon Sites

The 11 Mogollon sites include the three with Archaic occupations mentioned above. LA 54364 is ranked relatively low on the basis of amount of deposition, although small sites present advantages in terms of ease of analysis and lack of ambiguity in interpretation. Sites with moderate ranks are LA 54362 and LA 54374, with good deposition and potential for dating ceramic types. LA 54359 features both good deposition and the other advantages of small sites.

Five sites with Mogollon components were assigned a high rank. LA 54363 and LA 54368 are both large sites with good multicomponent deposition, potential for cross-dating ceramics and point types, and are subject to a variety of adverse effects. In addition, structures may be present on LA 54363, increasing its significance as these are very rare in the area. LA 54369 and LA 54375 have good deposition and large quantities of burned rock, suggesting potential for dating ceramic and point types. In addition, LA 54375 may contain faunal remains since mineralized bone is present on the site surface. LA 54394 has good deposition and potential for dating ceramics. This site represents a long term or multipurpose camp, similar to LA 54363 and LA 54368 but with a size more amenable to archaeological data recovery and interpretation. Finally, LA 54388 excellent deposition and represents a potentially single component site of great analytical value subject to severe impacts.

10.4.2 Sites with Insufficient Data for Complete Assessment of Potential

All sites with insufficient data for a complete assessment of potential should be considered eligible for the National Register until evidence to the contrary is obtained by further testing. Testing for eligibility is the recommended next-stage treatment.

10.4.2.1 Archaic Sites

Of the three Archaic sites with incomplete data for assessment, two have occupations that overlap with Mogollon sites. All three sites have relatively small surface areas. The possibly single component Archaic site (LA 54380) has potentially good cultural deposition and is assigned a high rank. The multicomponent Archaic and Mogollon sites (LA 54357 and LA 54367) are assigned a low rank because of the paucity of materials and uncertainty of deposition.

10.4.2.2 Mogollon Sites

There are five Mogollon sites in the insufficient data category, in addition to the two multicomponent sites mentioned above. Two of these (LA 54358 and LA 54367) are ranked low because of uncertain cultural deposition, although one site (LA 54358), if it has in situ materials, offers the analytical advantages of small sites. LA 54360 is ranked intermediate

because, although deposition is uncertain, it has potential for dating locally occurring ceramic types. LA 54376 is assigned an intermediate rank because it is likely to have substantial deposition. Finally, LA 54361 is given a high rank because of its combination of good deposition with a possible structural alignment.

10.4.2.3 Sites of Unknown Age

There are 16 sites of unknown age and cultural affiliation which are difficult to assess. Four sites are ranked low because deposition is uncertain, although these sites do offer the analytical advantages of small sites. Six sites ranked intermediate have good deposition potential, with three of these also offering the advantages of small sites. Four other sites with the potential for substantial cultural deposition are currently undergoing aeolian deposition, making their potential difficult to assess; these are also assigned an intermediate rank. One site (LA 54372) has the potential for substantial deposition, along with the possibility of superimposed deposits. Finally, LA 54392 features good deposition potential, combined with a significant artifact assemblage of pebble bipolar reduction, high quality biface reduction, and a high frequency of formal tools and utilized flakes. This lithic assemblage is unlike any other in the area, making it clearly important for future research.

10.5 DATA RECOVERY STRATEGIES

The design of data recovery strategies for endangered resources must consider future research potential and significance (Table 10.2), realistic limits on expendable effort, and degree of probable impact (Table 10.1). The level of effort recommended can be adjusted as true levels of impact are determined. Full data recovery is probably appropriate only for those sites threatened with total destruction. The following recommendations are based on in depth site and artifact analysis; they update recommendations supplied with Laboratory of Anthropology site forms.

10.5.1 Methodological Considerations

This proposed data recovery plan for the WIPP Project sites takes into account important research and management problems related to chronology, as well as other characteristics of local sites that present special problems for the excavator. These characteristics typically include very rare occurrence of structures, frequency of short term encampments, a typical site structure consisting of dispersed hearths and associated artifact scatters, and a settlement pattern combining dispersed camps away from water with intensive reuse of favorable locations near water sources. These characteristics create certain stratigraphic difficulties for the archaeologist. The dispersed nature of settlement and the short duration of camps, along with the absence of durable structures, mean that site deposits are ephemeral. This poor site visibility is, in turn, intensified by the mobility of the sandy topsoil and the movement of sand dunes across sites. Dune formation has been exacerbated by overgrazing in the area beginning in the late 1800s and by localized spraying of dense shin oak stands, which has reduced vegetative stabilization of the top 15-20 cm of topsoil, leaving it very vulnerable to erosion. Sites

not covered by sand may be concealed by the remaining dense stands of shin oak and mesquite. These patterns affect nearly all sites located during the present study.

On the other hand, sites near water sources (e.g., LA 54363, LA 54368, and LA 54390) probably represent many episodes of camping, perhaps of longer average duration than for nonwater source area sites. The more intensive use of the water source area has produced more visible site deposits, but the temporal relationship of these occupations, perhaps often spatially discrete but sometimes overlapping, is apt to be very ambiguous. Stratigraphic establishment of the temporal relationship of features, especially important for their potential to produce datable C-14, archaeomagnetic, and obsidian hydration samples, is consequently expected to be difficult.

In addition to the problems of site invisibility and subtlety or absence of stratigraphic context, the typical site structure in the project area consists of a continuum from articulated hearths to scattered fire-cracked rock with associated artifact scatters of varying density. As was discussed above, sites in the area are subject to burial and loss of stratigraphic context because of the extreme mobility of the sandy substrate. The biased view of sites based on surface exposure should be emphasized. Sites exposed in blowouts and subjected to aeolian erosion and cattle trampling may appear totally different in terms of blowout shape, exposed artifacts, and integrity of deposits when observed at two different times several months apart. Amateur collection is a serious problem in the area, but many sites are protected at present by distance from roads and relatively low population densities.

10.5.2 Recommended Data Recovery Strategies

Although additional testing is needed for 24 sites to determine their eligibility for the National Register, specific data recovery strategies can be recommended for 14 sites already judged eligible. These sites include two very large multicomponent sites, a possible PaleoIndian or Early Archaic site, a possible single component Mogollon camp, five significant moderate sized sites with intact hearths and 50-90% intact deposits, a Mogollon site with moderate site integrity and intact hearths, and four sites with moderate site integrity and no intact hearths. It is recommended that data recovery strategies adopted take into account the magnitude, intensity, and certainty of impact once these are known.

Recommended Strategies for Very Large Multicomponent Sites. The two complex sites LA 54363 and LA 54368 present special problems for data recovery in that:

- Many features, both intact and disarticulated, are present;
- Site deposits are 65-70% intact; and
- Both Archaic and Mogollon components are present.

Because of sheer numbers of features and intact deposits, detailed mapping is necessary before more intensive data collection strategies can be devised. The mapping process should consist of two stages:

- 1) Accurate plane-table or photogrammetric mapping in three dimensions of all terrain containing cultural materials is recommended. Counts should be made for each artifact class - chipped stone, groundstone, ceramics, and burned rock - by blowout. Paleosol exposures should be marked for each blowout.
- 2) Auger tests should be placed outside of the site or concentration boundaries defined on the basis of surface exposed artifacts. LA 54368 would require 100-200 such tests; LA 54363 would require 200-400 auger tests. These tests should provide the basis for extending site boundaries when necessary to include subsurface deposits.

Further decisions on data recovery strategies should be based on revised data on distribution and deposit boundaries. Artifact counts per blowout would suggest variability in artifact density and would be one factor used in structuring a stratified sample of the site. The map would provide information on blowout depth, blowout size, and paleosol presence, which should also be considered in stratifying the sites for controlled surface collection and testing.

Recommended Strategy for the Possible Paleosol Site. In the event that LA 54385 should suffer impacts requiring treatment, a field data recovery program emphasizing the detection of previous deflationary episodes should be implemented. This site's unusual lithic assemblage, mineralized bone, and feature(s) intruded into a very old paleosol suggest substantial antiquity; it is therefore conceivable that the entire site has undergone previous deflation and subsequent aeolian reburial and exhumation. In this case, data recovery should appropriately begin by mapping and site assemblage collection, to be followed by excavation of two 3 x 3 m units in the high relief pediments to the west and northeast of the Feature 1 hearth excavated during the testing phase reported here.

The purpose of these units would be to determine if artifacts within dune pediments lie on buried deflation surfaces suggesting a previous episode of deflation and reburial, or if cultural materials still retain some degree of depositional integrity. The units proposed are large (3 x 3 m) to ensure that cultural materials are encountered on this rather sparse site. In the event that evidence of depositional integrity is not found, no further work would be indicated; should potentially intact deposits be encountered, full data recovery would require that additional 2 x 2 m or 3 x 3 m tests be installed in dune pediments adjacent to the northern and southern extremes of the site. Pediments should be faced at intermediate locations so as to permit stratigraphic interpolation; alternatively, a stratigraphic study trench could be excavated along the eastern site perimeter so as to link stratigraphically all test units not located in isolated pediments.

Recommended Strategy for a Single Component Mogollon Site. Site LA 54388 presents a special case in several ways:

- It is the only site encountered in the present study for which full mitigative data recovery is recommended, due to ongoing impact;
- It is the only site in which substantial unambiguous chronometric potential is confidently thought to exist; and
- It is a sufficiently small site that total excavation represents feasible and appropriate treatment.

Evidence from test pits and augering (Chapter 6) indicate that LA 54388 probably represents a single component camp containing multiple intact hearths and deep, spatially restricted cultural deposition lying in pediments to the east and west of the exposed site area. These buried deposits are readily recognizable in auger testing.

In this site, it is proposed that data recovery proceed as a three-stage process.

- 1) Accurate mapping in 3 dimensions of all visible terrain and cultural features with intensive gridded auger testing of some 100 test holes on pediments to the east and west of the exposed site. This procedure will permit determination and mapping of the location, extent and depth of the buried occupation surface known to be present at this site.
- 2) Excavation of 1 x 2 m or 2 x 2 m units over all features encountered on the surface or in augering; this will entail the excavation of roughly 50 square meters of the site, to a depth ranging from a few centimeters to 1.5 meter or more.
- 3) Excavation of stratigraphic trenches or suitably spaced 1 x 1 m units in a quantity sufficient to ensure the successful correlation of all stratigraphic units encountered on the site. Probably an additional 40 square meters of excavation will be required.

The purpose of this intensive effort is twofold: protection of an endangered single component small site data base, and recovery of assemblage, spatial, and chronometric data comparable to that recovered at ENM 10230 and ENM 10418 (Lord and Reynolds 1985), but of substantially greater value in the event that LA 54388 should prove, as expected, to be a single component site.

Significant Sites with High Site Integrity. Five eligible sites have from 2 to 10 intact hearths and good potential for future research. LA 54362, LA 54369, and LA 54375 are Mogollon sites, LA 54366 is an Archaic site, and LA 54394 is of unknown age. Two of the sites were tested; both show evidence of in situ cultural deposition. Site integrity is thought to range from 50% to 90%. Testing at the sites should focus on chronometric potential and site structure.

These relatively complex sites should be assessed through a program entailing mapping, surface collection, and test excavation. These measures should allow in-depth assessment of site complexity and integrity; further

treatment should be planned using data developed in this initial treatment stage.

The mapping phase would involve recording terrain, cultural features, and artifact locations in three dimensions. These maps can be compared with the site maps made in November 1985 to March 1986 in terms of changes in artifact exposures and blowout shape. Blowout depth and paleosol presence would be mapped. Site boundaries based on artifacts exposed at the surface would be pin flagged and revised based on results of auger tests. Auger tests would be placed approximately every 30-40 m linear distance along the site boundaries and at distances ranging from 5-20 m outside the surface defined boundary. An average of 35 auger tests per site would be required.

The surface collection strategy should be aimed at obtaining voucher specimens to evaluate reliability of in field analysis and to enable detailed analysis. All chipped and ground stone artifacts, ceramics, and bones should be collected after piece plotting. Microscopic examination of lithic utilization, ceramic temper, and type determination using type collections would be possible.

All pediments adjacent to blowouts should be augered. This process will require an average of 4 auger tests per blowout, or 40 per site.

Finally, test pits will be placed on features. From three to five 1 x 2 m test pits should be placed on each site; these should be situated to expose burned rock and lithic reduction areas. Ash, charcoal, and other stratigraphic evidence would allow assessment of deposit integrity, as well as producing chronometric samples. When heating pit contents appear to be in situ, test pits or a test trench will be necessary to link the features stratigraphically. A mean of 16 one square meter shovel tests would be required per site. Additional test pits centered on features may be necessary if in situ deposits are located, depending on the degree of impact to the site. If no in situ deposits are located in test pits or auger tests, site integrity would be judged to be low and mitigation work can be terminated.

Recommended Strategy for a Mogollon Site with Low Integrity and Significance. LA 54364 is a Mogollon site with deposits judged to be 25% intact. Data recovery on this site should be aimed at further assessing site integrity; initial testing indicated the site was primarily deflated. Test pits (2 x 2 m) should be placed in the two remaining burned caliche scatters in the southern area of the blowout. The dune pediments along the eastern site portion should be tested by 5-10 auger tests. If in situ deposits are encountered in the burned rock concentration, three shovel trenching tests should be placed between them to establish stratigraphic relationships. If no in situ deposits are encountered in test pits or auger tests, no further mitigation is required at the site. Should deposits with potential be encountered, a second stage mitigation plan should be developed.

Recommended Strategies for Sites with Moderate Site Integrity. LA 54381 is an Archaic site, LA 54374 and LA 54359 are Mogollon sites, and LA 54373 is an Archaic and Mogollon site. All three are sites with moderate research potential, no recognizably intact hearths, moderate site size (3000-9000

square meters), and site integrity ranging from 30-50%. Two of the sites (LA 54373 and LA 54374) were tested, producing evidence of ash lenses and charcoal.

The first stage mitigation measures proposed for these sites involve detailed mapping, controlled surface collection, auger testing, and test excavation; second stage treatment should be planned based on the results of the first stage.

Mapping would entail recording physiographic features, cultural features, and artifact locations in three dimensions. These maps can be compared with maps from the 1985-1986 season and with maps from the high integrity sites, especially in terms of blowout depth and number of artifacts exposed. Site boundaries based on artifacts exposed at the surface will be pin flagged and revised according to auger test results. Auger tests should be placed every 10 m of linear distance along the site boundary, at distances from the boundary ranging from 5-10 m. A mean of 30 auger tests per site would be required.

The surface collection strategy should be focused on obtaining voucher specimens as a check on in field analysis and to allow detailed analysis in the laboratory. Laboratory analysis would include recording attributes such as utilization using microscopes and determining ceramic and point types using type collections. Lithic, ceramic, and bone artifacts should be collected after point-proveniencing.

All pediments adjacent to blowouts should be auger tested. LA 54374 has been extensively augered, but tests were confined to the northern half of the site. An average of 25 additional auger tests should be placed on each site.

Finally, test pits should be centered on features, all of which are scatters of burned rock. An average of three 1 x 2 m pits will be necessary. If these show evidence of in situ deposition, then each pair of features must be linked stratigraphically by means of from three to six 1 square meter shovel tests; an average of 12 shovel tests per site would be required. Additional test pits may be necessary if in situ deposits are encountered; their extent will depend on the results of the initial test pit phase. If no in situ deposits are located, site integrity may be so low that mitigation work can be terminated after this phase is complete.

11.0 LITERATURE CITED

PUBLISHED MATERIALS

Anyon, Roger

- 1985 Archaeological Testing at the Fairchild Site (LA 45732) Otero County, New Mexico. Prepared for U.S. Army Corps of Engineers, Albuquerque District. Office of Contract Archaeology, University of New Mexico.

Anyon, Roger, Patricia A. Gilman, and Steven A. LeBlanc

- 1981 A Reevaluation of the Mogollon-Mimbres Archaeological Sequence. The Kiva 46:209-225.

Applegarth, J.S.

- 1975 Environmental Implications of Hapeto-faunal Remains from Archaeological Sites West of Carlsbad, New Mexico. Paper presented at the Symposium for Biological Investigations in the Guadalupe Mountains National Park, Texas.

Applegarth, S.M.

- 1976 Prehistoric Utilization of Environment of the Eastern Slopes of the Guadalupe Mountains, Southeastern New Mexico. Unpublished Ph.D. dissertation, Anthropology Department, University of Wisconsin, Madison.

Arany, Lynne

- 1977 Ceramic Analysis. In Caprock Water System Archaeological Project, Lea County, New Mexico. Agency for Conservation Archaeology, Eastern New Mexico University, Portales.

Ayre, M.Y.

- 1936 Archaeological and Faunal Material from Williams Cave, Guadalupe Mountains, Texas. Proceedings: Philadelphia Academy of Natural Sciences 88:599-618.

Bailey, L.R.

- 1966 Indian Slave Trade in the Southwest. Westernlore, Los Angeles.

Bandelier, Adolph F.A.

- 1922 The Journey of Alvar Nunez Cabeza de Vaca and his Companions from Florida to the Pacific 1528-1536. Allerton, New York.

Beck, Warren A.

- 1971 New Mexico: A History of Four Centuries. University of Oklahoma, Norman.

- 1969 Historical Atlas of New Mexico. University of Oklahoma, Norman.

Bell, Robert E.

- 1958 Guide to the Identification of Certain American Indian Projectile Points. Oklahoma Anthropological Society Special Bulletin 1.

- 1960 Guide to the Identification of Certain American Indian Projectile Points. Oklahoma Anthropological Society Special Bulletin 2.

Benavides, Fray Alonso de

- 1965 The Memorial of Fray Alonso de Benavides, 1630. University of New Mexico, Albuquerque.

Bertram, Jack B.

- 1985 Overview of Northeastern New Mexico and Southeastern Colorado. Ms. on file, Mariah Associates, Albuquerque.

Binford, Lewis R.

- 1982 The Archaeology of Place. Journal of Anthropological Archaeology 1:5-31.

Bolton, Herbert E.

- 1911 The Jumano Indians 1650-1771. Southwestern Historical Quarterly 15:66-84.

- 1916 Spanish Exploration in the Southwest. Barnes and Noble, New York.

- 1949 Coronado, Knight of Pueblos and Plains. McGraw-Hill, New York.

Borillo, F.J.

- 1971 An Investigation of Surface Collected Clovis, Folsom and Midland Projectile Points from Blackwater Draw and Adjacent Localities. Unpublished M.A. thesis, Department of Anthropology, Eastern New Mexico University, Portales.

Bryant, Vaughn M., Jr.

- 1969 Late Full-glacial and Post-glacial Pollen Analysis of Texas Sediments. Unpublished Ph.D. dissertation, Department of Geology, University of Texas, Austin.

- 1977 Preliminary Pollen Analysis of Hind's Cave. In Archaeological and Botanical Studies at Hind's Cave, Val Verde County, Texas, edited by H.J. Shafer and V.M. Bryant, pp. 70-79. Texas A & M University, Anthropology Laboratory Special Series 1, College Station.

Burns, Bruce A.

- 1977 Ceramics - ENM 10017. In Caprock Water System Archaeological Project, Lea County, New Mexico, edited by J.L. Haskell, pp. 213-302. Agency for Conservation Archaeology, Eastern New Mexico University, Portales.

- 1980 The Ceramic Analysis. In Report of the Mitigation of Archaeological Sites in the Proposed Haystack Mountain ORV Area, edited by Scott C.

Schermer, pp. 97-134. Agency for Conservation Archaeology, Eastern New Mexico University. Portales. Cabeza de Baca, Fabiola.

- 1954 We Fed Them Cactus. University of New Mexico, Albuquerque. Camilli, Eileen L., and Christina G. Allen (assemblers) 1979 A Cultural Resources Overview for the Bureau of Land Management Roswell District. Office of Contract Archaeology, Department of Anthropology, University of New Mexico. Submitted to USDI Bureau of Land Management, Roswell District, Roswell, New Mexico.

Castaneda, Carlos E.

- 1936 Our Catholic Heritage in Texas (7 vols.). Knights of Columbus, Austin.

Chugg, J.C., G.W. Anderson, D.L. King, and L.V.H. Jones

- 1971 Soil Survey of Eddy Area, New Mexico. Soil Conservation Service in cooperation with the New Mexico Agricultural Experiment Station. U.S. Government Printing Office, Washington, D.C.

Collins, Michael B.

- 1966 The Andrews Lake Sites: Evidence of Semi-sedentary Prehistoric Occupation in Andrews, Texas. Transactions of the Second Regional Archaeological Symposium for Southeastern New Mexico and Western Texas. Midland Archaeological Society Bulletin 1:27-43.

- 1968 The Andrews Lake Locality: New Archaeological Data from the Southern Llano Estacado, Texas. Unpublished M.A. thesis, Department of Anthropology, University of Texas, Austin.

- 1971 A Review of Llano Estacado Archaeology and Ethnohistory. Plains Anthropologist 16:85-104.

Cordell, L.S.

- 1979 A Cultural Resources Overview of the Middle Rio Grande Valley, New Mexico. University of New Mexico. Submitted to USDA Forest Service, USDI Bureau of Land Management. Copies available from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C.

Corley, J.

- 1965 A Proposed Eastern Extension of the Jornada Branch of the Mogollon. Transactions of the First Regional Archaeological Symposium for Southeastern New Mexico and Western Texas. Lea County Archaeological Society Bulletin 1:30-36.

Couzzourt, Jim

- 1982 Archaeological Testing at Cal Farley's Boys' Ranch, Oldham County, Texas. Part 1: The Maintenance Barn Site (A 1543). In Transactions of the Seventeenth Regional Archaeological Symposium for Southeastern New Mexico and Western Texas, pp. 57-134.

Cremony, J.C.

- 1868 Life Among the Apaches. A. Roman & Co., San Francisco.

Downton, W.J.S.

- 1975 The Occurrence of C. Photosynthesis among Plants. Photosynthetica 9:96-105.

Eickmeier, W.G.

- 1978 Photosynthetic Pathway Distributions along an Aridity Gradient in Big Bend National Park, and Implications for Enhanced Resource Partitioning. Photosynthetica 12:290-297.

Eighmy, Jeffrey L.

- 1984 Colorado Plains Prehistoric Context. Colorado Historical Society, Denver.

Ellis, F.H., and L. Hammack

- 1968 The Inner Sanctum of Feather Cave. a Mogollon Sun and Earth Shrine Linking Mexico and the Southwest. American Antiquity 33:25-44.

Ferdon, Edwin N., Jr.

- 1946 An Archaeological Excavation of Hermit's Cave, New Mexico. School of American Research Monograph No. 10, Santa Fe.

Forbes, Jack D.

- 1960 Apache, Navajo, and Spaniard. University of Oklahoma, Norman.

Freeman, C.E.

- 1972 Pollen Study of Some Holocene Alluvial Deposits in Dona Ana County, Southern New Mexico. Texas Journal of Science 24:203-220.

Frizell, Jon

- 1985 Ceramics. In Archaeological Investigations of Three Sites Within the WIPP Core Area, Eddy County, New Mexico, ed. Kenneth J. Lord and William E. Reynolds, pp. 113-124. Chambers Consultants and Planners, Albuquerque. Prepared for Albuquerque District, U.S. Army Corps of Engineers.

Gifford, Diane P.

- 1978 Ethnoarchaeological Observations of Natural Processes Affecting Cultural Materials. In Explorations in Ethnoarchaeology, ed. Richard A. Gould, pp. 77-101. School of American Research/University of New Mexico: Albuquerque.

Gregg, Josiah

- 1954 Commerce of the Prairies. Edited by Max L. Moorhead. University of Oklahoma, Norman.

- Hackett, Charles Wilson (ed.)
 1937 Historical Documents Relating to New Mexico, Nueva Viscaya, and Approaches Thereto, to 1773, v.3. Carnegie Institute of Washington. Publication No. 330. Washington, D.C.
- Hackett, Charles Wilson
 1942 Revolt of the Pueblo Indians of New Mexico and Otermin's Attempted Reconquest 1680-1682. University of New Mexico, Albuquerque.
- Hafsten, Ulf
 1961 Pleistocene Development of Vegetation and Climate in the Southern High Plains as Evidenced by Pollen Analysis. In Paleoecology of the Llano Estacado, edited by F. Wendorf, pp. 59-91. Fort Burgwin Research Center Publication 1, Ranchos de Taos, New Mexico.
- Haley, J. Evetts
 1935 The Comanchero Trade. Southwestern Historical Quarterly 38(3):157-176.
- Hammond, George P., and Agapito Rey
 1940 Narratives of the Coronado Expedition 1540-1542. Edited by George Hammond. Coronado Cuarto Centennial Publications, Vol. 2. University of New Mexico, Albuquerque.
- 1953 Don Juan de Onate, Colonizer of New Mexico 1593-1628. Albuquerque.
- 1966 The Rediscovery of New Mexico 1580-1594: The Exploration of Chamuscado, Espejo, Castano de Sosa, Morlete, and Leyva de Bonilla and Humana. University of New Mexico, Albuquerque.
- Hard, Robert Jarratt
 1983 Excavations in the Castner Range Archaeological District in El Paso, Texas. Publications in Anthropology 11, El Paso Centennial Museum, University of Texas, El Paso.
- Haskell, J. Loring (editor)
 1977 Caprock Water System Archaeological Project, Lea County, New Mexico. Agency for Conservation Archaeology, Eastern New Mexico University, Portales.
- Haury, Emil W.
 1936 Some Southwestern Pottery Types, Series IV. Medallion Papers 19. Gila Pueblo, Globe, Arizona.
- Haynes, C. Vance, Jr.
 1967 Carbon-14 dates and Early Man in the New World. In Pleistocene Extinctions: The Search for a Cause, edited by P.S. Martin and H.E. Wright, Jr., pp. 267-286. Proceedings of the VII Congress of the International Association for Quaternary Research Vol 6. Yale University, New Haven, Connecticut.

Hester, J.J.

- 1967 The Agency of Man in Animal Extinctions. In Pleistocene Extinctions: The Search for a Cause, edited by P.S. Martin and H.E. Wright, Jr., pp. 169-200. Proceedings of the VII Congress of the International Association for Quaternary Research 6. Yale University, New Haven, Connecticut.

Howard, E.B.

- 1935 Evidence of Early Man in North America. University of Pennsylvania, Museum Journal 24:53-171.

Hughes, Jack T., and Patrick S. Willey (edited by R.S. Weddle, K. Freydenfeldt and C. Tunnell)

- 1978 Archaeology at MacKenzie Reservoir. Office of the State Archaeologist, Survey Report 24. Texas Historical Commission, Austin.

Hurst, W.

- 1976 An Archaeological Reconnaissance of the Maroon Cliffs, Eddy County, New Mexico. Ms. on file with the Agency for Conservation Archaeology, Eastern New Mexico University, Portales.

Irwin-Williams, Cynthia

- 1973 The Oshara Tradition: Origins of Anasazi Culture. Eastern New Mexico Contributions in Anthropology 1, no. 2.

Irwin-Williams, C., and C.V. Haynes, Jr.

- 1970 Climate Change and Early Population Dynamics in the Southwestern United States. Quaternary Research 1:59-71.

Jelinek, Arthur J.

- 1960 An Archaeological Survey of the Middle Pecos River Valley and the Adjacent Llano Estacado. Unpublished Ph.D. dissertation, Department of Anthropology, University of Michigan, Ann Arbor.

- 1966 Correlation of Archaeological and Palynological Data. Science 152:1507-1509.

- 1967 A Prehistoric Sequence in the Middle Pecos Valley, New Mexico. Anthropological Papers No. 31. Museum of Anthropology, University of Michigan, Ann Arbor.

Jennings, J.D.

- 1940 A Variation of Southwestern Culture. Laboratory of Anthropology, Technical Series 19. Santa Fe.

John, Elizabeth

- 1975 Storms Brewed in Other Men's Worlds: The Confrontation of Indian, Spanish, and French in the Southwest 1540-1795. Texas A & M University, College Station.

- Johnson, Eileen, Vance T. Holliday, Michael J. Kaczor, and Robert Stuckenrath.
1977 The Garza Occupation of the Lubbock Lake Site. Bulletin of the Texas Archaeological Society 48:83-109.
- Johnson, L., Jr.
1967 Toward a Statistical Overview of the Archaic Cultures of Central and Southwestern Texas. Texas Memorial Museum, Bulletin No. 12, Austin.
- Judge, W. James
1973 Early Man, Plains and Southwest: An Interpretive Summary of the Paleo-Indian Occupation of the Plains and Southwest. Handbook of North American Indians, vol. 3, edited by W.D. Sturtevant, in press.
- Katz, Paul, and Susanna Katz
1979 A Status Report on Research into the Prehistory of Guadalupe Mountains National Park, Texas. In Jornada Mogollon Archaeology: Proceedings of the First Jornada Conference, edited by Patrick H. Beckett and Regge N. Wiseman, pp. 359-370. New Mexico Historic Preservation Bureau, Santa Fe.
- Keleher, William A.
1962 The Fabulous Frontier. University of New Mexico, Albuquerque.
1964 Turmoil in New Mexico 1846-1868. Rydal Press, Santa Fe.
- Kelley, Jane Holden
1966 The Archaeology of the Sierra Blanca Region of Southeastern New Mexico. Unpublished Ph.D. dissertation, Anthropology Department, Harvard University, Cambridge.
- Kenner, Charles L.
1969 A History of New Mexican-Plains Indian Relations. University of Oklahoma, Norman.
- Kessell, John L.
1979 Kiva, Cross, and Crown: The Pecos Indians and New Mexico 1540-1840. National Park Service, U.S. Department of the Interior. Washington, D.C.
- Klasner, Lily
1972 My Girlhood Among Outlaws. University of Arizona, Tucson.
- Klein, J., J.C. Lerman, P.E. Damon, and E.K. Ralph
1982 Calibration of Radiocarbon Dates: Tables Based on the Consensus Data of the Workshop on Calibrating the Radiocarbon Time Scale. Radiocarbon 24(2):103-150.
- Kyte, Michael
1984 A Mitigation Report of LA 18777, Eddy County, New Mexico. Agency for Conservation Archaeology, Eastern New Mexico University, Portales.

Landis, Daniel G.

- 1985 Archaeological Investigations at Portions of LA 17041 and LA 48356, Eddy County, New Mexico. Agency for Conservation Archaeology Report MB85.1, Eastern New Mexico University, Portales.

LeBlanc, Steven A., and Michael E. Whalen

- 1980 An Archaeological Synthesis of South-Central and Southwestern New Mexico. Office of Contract Archeology, University of New Mexico, Albuquerque.

Lehmer, D.

- 1948 The Jornada Branch of the Mogollon. University of Arizona Social Science Bulletin 17, Tucson.

Lekson, Stephen H.

- 1984 Archaeological Reconnaissance of the Rio Grande Valley, Sierra County, New Mexico. New Mexico State Historic Preservation Division, Contract 35-84-8317.06. Santa Fe, New Mexico.

Leslie, Robert H.

- 1978 Projectile Point Types and Sequence of the Eastern Jornada Mogollon. Regional Archaeological Symposium for Southeastern New Mexico and West Texas, Transactions 13:1-157. Southwestern New Mexico Federation of Archaeological Societies, Midland, Texas.

- 1979 The Eastern Jornada Mogollon, Extreme Southeastern New Mexico. In Jornada Mogollon Archaeology: Proceedings of the First Jornada Conference, ed. by Patrick H. Beckett and Reggie N. Wiseman, pp. 179-199. New Mexico Historic Preservation Bureau, Santa Fe.

Levine, F., and C.M. Mobley

- 1976 Archaeological Resources at Los Esteros Lake, New Mexico. Southern Methodist University Contributions in Anthropology 17, Dallas.

Levine, Frances, and Joseph Winter (editors)

- 1987 Final Report of Investigations at Sites 48 and 77, Santa Rosa Lake, Guadalupe County, New Mexico. Ms. on file at U.S. Army Corps of Engineers, Albuquerque District, Albuquerque.

Lintz, Christopher

- 1984 Architecture and Community Variability within the Antelope Creek Phase of the Texas Panhandle. Ph.D. dissertation, University of Oklahoma. University microfilms, Ann Arbor.

Long, Austin, and Bruce Rippertean

- 1974 Testing Contemporaneity and Averaging Radiocarbon Dates. American Antiquity 309:205-215.

Lord, Kenneth J.

- 1985 Field Methodology and Site Descriptions. In Archaeological Investigations of Three Sites within the WIPP Core Area, Eddy County, New Mexico, edited by K.J. Lord and W.E. Reynolds, pp. 47-111.

Prepared for U.S. Army Corps of Engineers, Albuquerque District.
Chambers Consultants and Planners, Albuquerque.

Lord, Kenneth J., and William E. Reynolds (editors)

- 1985 Archaeological Investigations of Three Sites within the WIPP Core Area, Eddy County, New Mexico. Prepared for J.S. Army Corps of Engineers, Albuquerque District. Chambers Consultants and Planners, Albuquerque.

Marshall, Michael P.

- 1973a Background Information on the Jornada Culture Area. In Technical Manual: 1973 Survey of the Tularosa Basin, pp. 19-119. Human Systems Research, Tularosa, New Mexico.
- 1973b Ceramic Descriptions. In Technical Manual: 1973 Survey of the Tularosa Basin, by Human Systems Research, pp. 326-374. Human Systems Research Tularosa.

Martin, Paul S.

- 1963 The Last 10,000 Years. University of Arizona, Tucson.
- 1967 Pollen Analysis of Prehistoric Middens near Ft. Sumner, New Mexico. In A Prehistoric Sequence in the Middle Pecos Valley, New Mexico, by Arthur J. Jelinek, pp. 130-134. Museum of Anthropology, University of Michigan, Anthropological Papers 31, Ann Arbor.

Matson, Daniel, and Albert Schroeder

- 1957 Cordero's Description of the Apaches, 1796. New Mexico Historical Review 32(4).

Mera, H.P.

- 1938 Reconnaissance and Excavation in Southeastern New Mexico. American Anthropological Association Memoirs No. 51, Washington, D.C.

Mobley, Charles M. (editor)

- 1978 Archaeological Research and Management at Los Esteros Reservoir, New Mexico. Archaeological Research Program, Southern Methodist University, Dallas.

Nials, Fred L.

- 1980 Geology of the Duval Study Area. In Implications of Archaeological Collections, Test, and Excavations in the Carlsbad Area, edited by Marc Thompson, pp. 4-23. Report 433. Cultural Resource Management Division, Report 433, New Mexico State University, Las Cruces.

Nials, Fred L., J. Loring Haskell, and David A. Yos

- 1977 The Environmental Setting. In Caprock Water System Archaeological Project Lea County, New Mexico, edited by J. Loring Haskell, pp. 11-40. Agency for Conservation Archaeology, Eastern New Mexico University, Portales.

Nielsen, Jeffrey

- 1977 An Archaeological Reconnaissance of a Proposed Site for the Waste Isolation Pilot Plant (WIPP). Sandia Laboratories, Albuquerque.

Noeyersons, J.

- 1978 The Behavior of Stones and Stone Implements Buried in Consolidated and Creeping Kalahari Sands. Earth Surface Process and Landforms 3:115-128.

O'Laughlin, Thomas C.

- 1980 The Keystone Dam Site and Other Archaic and Formative Sites in Northwest El Paso, Texas. Publications in Anthropology 8, El Paso Centennial Museum, University of Texas, El Paso.

Oldfield, F., and J. Schoenwetter

- 1975 Discussion of the Pollen Analytical Evidence. In Late Pleistocene Environments of the Southern High Plains, edited by F. Wendorf and J.J. Hester, pp. 149-177. Fort Burgwin Research Center Publication 9, Ranchos de Taos, New Mexico.

Opler, Morris E. and Catherine N. Opler

- 1950 Mescalero Apache History in the Southwest. New Mexico Historical Review 25(1).

Perino, Gregory

- 1968 Guide to the Identification of Certain American Indian Projectile Points. Oklahoma Anthropological Society Special Bulletin 3, Oklahoma City.

Perez de Luxan, Diego

- 1929 Expedition Into New Mexico Made by Antonio de Espejo 1582-1583: As Revealed In the Journal of Diego Perez de Luxan, A Member of the Party. Translated by George Hammond and Agapito Rey, Quivira Society Publications, Los Angeles.

Ralph, E.K., H.N. Michael, and M.C. Han

- 1973 Radiocarbon Dates and Reality. MASCA Newsletter 9(1):1-9. University of Pennsylvania, University Museum, Applied Science Center for Archaeology, Philadelphia.

Riskind, D., and T. Van Devender

- 1979 Pack Rats: Unwitting Helpers of Archaeologists. Texas Parks and Wildlife 37(3):6-9.

Schander, Mark D.

- 1985 Environment. In Archaeological Investigations of Three Sites Within the WIPP Core Area, Eddy County, New Mexico, ed. Kenneth J. Lord and William E. Reynolds, pp. 23-45. Chambers Consultants and Planners, Albuquerque. Prepared for Albuquerque District, U.S. Army Corps of Engineers.

Schermer, Scott C.

- 1978 Archaeological Clearance Report for Sandia Laboratories. Agency for Conservation Archaeology, Eastern New Mexico University, Portales.
- 1983 Report on Two Radiocarbon Dates Obtained from Feature 2, Site ENM 19233 on the WIPP Project Area near Carlsbad, New Mexico. Ms. on file with the Agency for Conservation Archaeology, Eastern New Mexico University, Portales.

Schultz, C.B., and L.D. Martin

- 1970 Quaternary Mammalian Sequence in the Central Great Plains. In Pleistocene and Recent Environments of the Central Great Plains, pp. 341-354. University of Kansas Press, Lawrence.

Sellards, E.H.

- 1955 Fossil Bison and Associated Artifacts from Milnesand, New Mexico. American Antiquity 20:336-344.

Shinkle, James D.

- 1970 New Mexican Ciboleros of the Llano Escabado. Hall-Poorbaugh, Roswell.

Simmons, Marc

- 1967 Border Comanches: Seven Spanish Colonial Documents 1785-1819. Translated by Marc Simmons. Stagecoach, Santa Fe.
- 1968 Spanish Government in New Mexico. University of New Mexico, Albuquerque.
- 1979 Settlement Patterns and Village Plans in Colonial New Mexico. New Spain's Far Northern Frontier: Essays on Spain in the American West, 1540-1821. edited by David J. Weber. University of New Mexico, Albuquerque.

Smith, Ralph A.

- 1962 Apache Plunder Trails Southward, 1831-1840. New Mexico Historical Review 37 (1):20-42.

Sonnichsen, C.L.

- 1958 The Mescalero Apaches. University of Oklahoma, Norman.

Speth, John D.

- 1983 Bison Kills and Bone Counts: Decision Making by Ancient Hunters. University of Chicago, Chicago.

Speth, John D., and William J. Parry

- 1978 Late Prehistoric Bison Procurement in Southeastern New Mexico: The 1977 Season at the Garnsey Site. Museum of Anthropology, University of Michigan, Technical Reports 8, Ann Arbor.

- 1980 Late Prehistoric Bison Procurement in Southeastern New Mexico: The 1978 Season at the Garnsey Site (LA 15889). Museum of Anthropology, University of Michigan, Technical Reports 11, Ann Arbor.
- 1984 The Garnsey Spring Camps: Late Prehistoric Occupation in Southeastern New Mexico. University of Michigan, Museum of Anthropology, Ann Arbor.
- Stuart, David E., and Fern P. Gantner
1981 Prehistoric New Mexico Backcountry for Survey. New Mexico Historic Preservation Bureau, Santa Fe.
- Stuiver, Minze
1982 A High-precision Calibration of the AD Radiocarbon Time Scale. Radiocarbon 24(1):1-26.
- Sohn, Dee Ann, and Edward B. Jelks
1982 Handbook of Texas Archaeology: Type Descriptions Texas Archaeological Society Special Publication 1, Austin.
- Syvetsen, J.P., G.L. Nickell, R.W. Speilberg, and C.L. Cunningham
1976 Carbon Reduction Pathways and Standing Crop in Three Chihuahuan Desert Plant Communities. Southwestern Naturalist 21:311-320.
- Thomas, Alfred B.
1940 The Plains Indians and New Mexico, 1751-1778. Coronado Historical Series, Vol. 2. University of New Mexico, Albuquerque.
- U.S. Department of Energy
1980 Final Environmental Impact Statement, Waste Isolation Pilot Plant, vol. Government Printing Office, Washington, D.C.
- Van Devender, T.R., R.E. Wiseman, and J.G. Gallagher
1978 Holocene Environments and Archaeology in Rocky Arroyo and Last Chance Canyon, Eddy County, New Mexico. American Antiquity, in press.
- Van Devender, T.R., and R.E. Wiseman
1977 A Preliminary Chronology of Bioenvironmental Changes during the PaleoIndian Period in the Monsoonal Southwest. The Museum Journal, West Texas Museum Association 17:13-27.
- Van Devender, T.R., and W.G. Spalding
1979 Development of Vegetation and Climate in the Southwestern United States. Science 204:701-710.
- Wallace, Ernest and E. Adamson Hoebel
1952 The Comanches: Lords of the South. University of Oklahoma, Norman.
- Ward, Albert E., Emily K. Aubink, and John R. Stein
1977 Ethnohistorical and Chronological Basis of the Navajo Material Culture. In Settlement and Subsistence Along the Lower Chaco River:

The CGP Survey, ed. Charles A. Reher, pp. 217-278. University of New Mexico, Albuquerque.

Warnica, J.M., and T. Williamson

1968 The Milnesand Site--Revisited. American Antiquity 33:1.

Weddell, Robert S.

1964 The San Saba Mission: Spanish Pivot in Texas. University of Oklahoma, Norman.

Wells, P.V.

1976 Macrofossil Analysis of Wood Rat (Neotoma) Middens as a Key to the Quaternary Vegetational History of Arid America. Quaternary Research 6:223-248.

1978 Post-glacial Origin of the Present Chihuahuan Desert Less than 11,500 Years Ago. In Transactions of the Symposium on the Biological Resources of the Chihuahuan Desert Region, United States and Mexico, edited by R.H. Waser and D.H. Riskin, pp. 67-83. Transactions and Proceedings Series 3, National Park Service. U.S. Government Printing Office, Washington, D.C.

Wendorf, Fred, Alex D. Krieger, and Claude C. Albritton

1955 The Midland Discovery. A Report on the Pleistocene Human Remains from Midland, Texas. University of Texas, Austin.

Whalen, Michael E.

1978 Settlement Patterns of the Western Hueco Bolson. University of Texas, El Paso Centennial Museum, Anthropological Paper 6, El Paso.

1980 Special Studies in the Archaeology of the Western Hueco Bolson. Publications in Anthropology 9, El Paso Centennial Museum, University of Texas at El Paso.

1981 Origin and Evolution of Ceramics in Western Texas. Bulletin of the Texas Archaeological Society 52:215-229.

Wilkinson, Leland

1986 SYSTAT: The System for Statistics. SYSTAT, Inc., Evanston, Illinois.

Willey, Patrick S., and Jack T. Hughes

1978 The Deadman's Shelter Site. In Archaeology at MacKenzie Reservoir, edited by J.T. Hughes and P.S. Willey, pp. 149-190. Texas Historical Commission, Office of the State Archaeologist, Archaeological Survey Report 24, Austin.

Wiseman, Reggie N.

1983 Archeological Taxonomy and Confusion - Welcome to the Jornada' New Mexico Archeological Council Proceedings 5, No. 1:4-9.

- 1984 Ceramics. In The Archaeology of the Late Prehistoric Occupation in the Pecos River Valley, by John D. Speth and William J. Parry. University of Michigan, Museum of Anthropology, Ann Arbor.

Wiseman, R.N., R. Corbett, and C. Hingson

- 1971 Preliminary Report of Salvage Excavations at LA 2112, Lincoln County. The Artifact 9:3.

Worcester, Daniel

- 1941 The Beginnings of the Apache Menace in the Southwest. New Mexico Historical Review 26(1).

York, John C., and William A. Block-Feddig

- 1969 Vegetation changes in southern New Mexico during the past hundred years. In Wild Lands in Perspective, ed. William C. McGinnies and Fred J. Goldman, pp. 135-155. American Academy for the Advancement of Science and University of Arizona, Washington, D.C., and Tucson.

UNPUBLISHED MANUSCRIPTS

Balgerman, Bill

- 1971 The Harroun Farms: Interview with Mrs. D.S. Harroun.
1983 Interview with Mr. Luke Fletcher.
n.d. The Harroun Farms Story and the Harroun Farms. Typescript ms.

Eddy County Genealogical Society

- 1981 1835 Census for Lincoln County, Territory of New Mexico. Transcribed by Josephine Hendley. Pecos Trails I(2):67-74 and II(1):4-12. Mimeographed. Courtesy of Joann Sharp, President of the Society.
1981 Production of Agriculture 1835, County of Lincoln, Territory of New Mexico. Transcribed by Josephine Hendley. Pecos Trails I(2):74-77 and II(1):13-15. Mimeographed. Courtesy of Joann Sharp.
1982 1900 U.S. Census, Eddy County, Territory of New Mexico. Transcribed by Josephine Hendley. Pecos Trails II(2):51-67 and III(2):56-61. Mimeographed. Courtesy of Joann Sharp.

Hendley, Josephine

- 1982a Special Transcription of 1900 U.S. Census, Eddy County, Territory of New Mexico, showing only Mexican-American families. Handwritten on census forms. Copy in my possession.

Kenney, Myra Eiler

- n.d. Settlement in the Rio Ruicoso-Rondo River Valley. Ms. prepared for the State Engineers Office. Santa Fe.

Myers, Leland C. and Philip J. Rasen

n.d.a The Tragedy of the Beckwiths. Ms. in possession of the author and Josephine Hendley.

n.d.b Annotated, typescript copy of the Reports of Scouts, Fort Davis, Texas, pp. 334-344. In possession of the author.

Schnaafsra, Curtis

1967 La Plaza de San Jose: Excavations in the Two Rivers Reservoir, Eddy County, New Mexico. Ms. in possession of the author.

Wilson, John P.

n.d.a The Two Rivers Reservoir in Relation to Southeastern Mexico History. Ms. on file with the author.

n.d.b Who Lived at San Jose? Ms. in the author's possession.

LOCAL PUBLICATIONS

Hendley, Josephine

1982 Old Seven Rivers. Eddy County, New Mexico to 1932. Southeastern New Mexico Historical Society, Carlsbad. In Carlsbad Public Library.

Myers, Leland C.

n.d. The Pearl of the Pecos. Bound copy in Carlsbad Public Library.

San Jose Church Directory, 1979.

Sieberg, Joanna James

1982 Joseph H. and Hanna Tomner James. Eddy County, New Mexico to 1932. Southeastern New Mexico Historical Society, Carlsbad.

ARCHIVAL RESOURCES CONSULTED

Rare Books and Map Collection, New Mexico State University, Las Cruces

Rio Grande Historical Collections/Hobson-Huntsinger University Archives. New Mexico State University, Las Cruces.

Southeastern New Mexico Historical Society Archives. Carlsbad Public Library.

State Historical Records and Archives, Santa Fe.

Map Library, Santa Fe.

INTERVIEWS CONDUCTED WITH LOCAL RESIDENTS

Mr. and Mrs. Kenny Smith (Present owners of former Livingston Ranch)
 Mr. and Mrs. Charles James (Local ranchers and descendants of Joseph James)
 Green London (Former cowboy and part owner of Crawford Ranch)
 Mrs. Ruth Poe (Original homesteader 1931)
 Mr. Mobley (Rancher)
 Mr. Mobley (Manager of Harroun Farms)
 Huling Ussery (Local celebrity, formerly ranched in the Guadalupe)
 Ray Anaya (Former sheriff, currently Juvenile Corrections Officer)
 Antonio Carasco (Organizer of Legal Aid Society in Carlsbad, Director of Centro de Salud in Loving, Former Mayor Pro Temp. of Loving)
 Mr. Acosta (Resident of Carlsbad in his 80s)
 Father Noel Krammer (San Jose Church)

INTERVIEWS WITH LOCAL HISTORIANS

Bill Balgeman, Carlsbad
 Josephine Hendley, Carlsbad
 Leland C. Myers, Las Cruces

APPENDIX A:

**Forms For In-field Artifact Analysis and
Test Excavations in the WIPP Study**

- Mariah Associates (New Mexico) Lithic Analysis Form
- Cores - Tools Form
- Mariah Associates Field Ceramic Analysis Form
- Historic Artifact Form
- Mariah Associates Field Inventory Form
- Mariah Associates Sample Form
- Mariah Associates Feature Form
- Mariah Associates Data Form

MARLAN ASSOCIATES NEW JERSEY LIGHT ANALYSIS FORM

[illegible]

APPENDIX A: Forms For In-Field Artifact Analysis and Test Excavations
in the WLTM Study

Page 2 of 3

| CORES: | | | | | |
|----------|---------|-----------|---------------|-----------|----------|
| Material | Texture | Core Type | Core Platform | Exhausted | Utilized |
| 1. | | | | | |
| 2. | | | | | |
| 3. | | | | | |
| 4. | | | | | |
| 5. | | | | | |
| 6. | | | | | |
| 7. | | | | | |
| 8. | | | | | |
| 9. | | | | | |
| 10. | | | | | |
| 11. | | | | | |
| 12. | | | | | |

| TOOLS: | | | |
|-----------|----------|---------|---------|
| Tool Type | Material | Texture | Portion |
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| 12. | | | |

APPENDIX A: Forms For In-Field Artifact Analysis and Test Excavations
in the WIPP Study

Page 3 of 5

UTILIZATION

of damaged edges

RETOUCH (# of retouched edges/type of retouch)

1. Unidirectional
2. Bidirectional
3. Both

Comments: Specify material sources if possible. Note whether or not sources appear similar to other sites in the area. Note thermal alteration. Note anything distinctive.

CONDITION

- | | |
|----------------|-------------|
| 1. Sandblasted | 3. Trumeled |
| 2. Burned | 4. Other |

CORES:

MATERIAL Same as for debitage. Note specific sources when possible.

TEXTURE Same as for debitage.

CORE TYPE

1. Unidirectional
2. Bidirectional
3. Multifacet
4. Pyramidal
5. Tested raw material

CORE PLATFORM

1. Cortical
2. Single Removal
3. Multiple Removal

EXHAUSTED Yes or no. This is a subjective evaluation on remaining flake potential.

BATTERED Yes or no. Has the core been reused as a tool?

CONDITION

- | | |
|----------------|-------------|
| 1. Sandblasted | 3. Trumeled |
| 2. Burned | 4. Other |

TOOLS:

TOOL TYPE Whether tool is a mano or a projectile or whatever.

MATERIAL Same as for debitage.

TEXTURE Same as for debitage.

PORTION Whether tool is whole or broken.

APPENDIX A: Forms For In-Field Artifact Analysis and Test Excavations
in the WIPP Study

Page 4 of 5

Estimate the fraction of lithic debitage monitored:

MATERIAL

Quartzite-qzt
Obsidian-obs
Chert-ct
Chalcedony-ch
Basalt-Bs
Silicified wood-sw

Source Data (based on type collection):

TEXTURE

1. Creamy to very fine
2. Medium grained
3. Coarse grained
4. Glassy (obsidian)
(Note: Texture crosscuts or is measured independently of material.)

DEBITAGE TYPE

1. Flake
2. Angular Debris
3. Bipolar Debris

FLAKE TYPE

1. Core Flake
2. Biface Flake
3. Blade (2 or more parallel scars)

PORTION

1. Whole
2. Broken
(Note: Angular debris is by definition whole or 1.)

DIMENSIONS

Length by Width by Thickness in millimeters.
(Note: Dimensions are measured on whole flakes only.)

CORTEX

Estimate % of dorsal cortex from 0-100%.

PLATFORM

0. Not applicable
1. Platform absent
2. Single facet
3. Multiple facet
4. Collapsed
5. Retouched
6. Cortical
7. Battered

APPENDIX A: Forms For In-Field Artifact Analysis and Test Excavations
in the WIPP Study

Page 2 of 5

REMOVE Re-use

GENERAL NOTES ON LITHIC ANALYSIS:

Be sure to estimate % of debitage monitored on whole site or provenience.
Monitor 100% of all cores and tools on every site.

CONDITION

- | | |
|----------------|-------------|
| 1. Sandblasted | 3. Trumeled |
| 2. Burned | 4. Other |

MARIAH ASSOCIATES, INC. FIELD CERAMIC ANALYSIS

THIS FORM IS TO BE USED FOR NON-COLLECTED CERAMICS ONLY. COLLECT ALL PAINTED/TOOLED/MODELED/CORDMARKED/RIM SHERDS.

[illegible]

APPENDIX A: Forms For In-Field Artifact Analysis and Test Excavations
in the WIPP Study

HISTORIC ARTIFACT FORM

Site # _____

Date _____

Sample Fraction _____

Recorder _____

| # | Item | Type | Contents | Design | Age |
|-----|------|------|----------|--------|-----|
| 1. | | | | | |
| 2. | | | | | |
| 3. | | | | | |
| 4. | | | | | |
| 5. | | | | | |
| 6. | | | | | |
| 7. | | | | | |
| 8. | | | | | |
| 9. | | | | | |
| 10. | | | | | |
| 11. | | | | | |
| 12. | | | | | |
| 13. | | | | | |
| 14. | | | | | |
| 15. | | | | | |
| 16. | | | | | |
| 17. | | | | | |
| 18. | | | | | |
| 19. | | | | | |
| 20. | | | | | |

SKETCH

MILLER ASSOCIATES

Project:

FIELD INVENTORY

[illegible]

MARTIN ASSOCIATES, INC.
SAMPLE FORM[illegible]

ACKNOWLEDGMENTS

[illegible]

APPENDIX A: Forms For In-Field Artifact Analysis and Test Excavations
in the WIPP Study

DATA FORM

| | | |
|----------|-------------|---------|
| RECORDED | DATE | BY |
| SYMBOL | FEATURE NO. | NUMBERS |

| EXCAVATION LEVELS | | | | | | |
|-------------------|---|---|---|---|---|---|
| STARTING | LEVEL | LEVEL | LEVEL | LEVEL | LEVEL | LEVEL |
| NE | NE | NE | NE | NE | NE | NE |
| NW | NW | NW | NW | NW | NW | NW |
| SE | SE | SE | SE | SE | SE | SE |
| SW | SW | SW | SW | SW | SW | SW |
| ARTIFACTS | <input type="checkbox"/> YES <input type="checkbox"/> NO | <input type="checkbox"/> YES <input type="checkbox"/> NO | <input type="checkbox"/> YES <input type="checkbox"/> NO | <input type="checkbox"/> YES <input type="checkbox"/> NO | <input type="checkbox"/> YES <input type="checkbox"/> NO | <input type="checkbox"/> YES <input type="checkbox"/> NO |

| ARTIFACT LOGS | | | | | | | |
|---------------|----------|----------|--------|----------|----------|--------|----------|
| LOT NO | LEVEL NO | CONTENTS | LOT NO | LEVEL NO | CONTENTS | LOT NO | LEVEL NO |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

| PHOTOS | | | |
|--------|-------------|--------|-------------|
| NUMBER | PROVENIENCE | NUMBER | PROVENIENCE |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

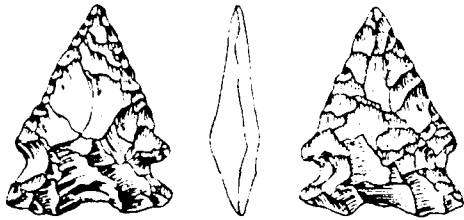
CONTINUATION SHEETS

| | | |
|---------------------------------------|---|--------------------------------|
| <input type="checkbox"/> PLANS | <input type="checkbox"/> SAMPLE FORM | <input type="checkbox"/> OTHER |
| <input type="checkbox"/> FEATURE FORM | <input type="checkbox"/> INVENTORY FORM | <input type="checkbox"/> OTHER |

APPENDIX B:
Collected Lithic Tools

APPENDIX B: Collected Lithic Tools

SCALE 1:1



1: LA 54357

Artifact Number: 1
 Artifact Type: Projectile point
 Site Number: LA 54357
 Material: Chert
 Color: Light gray
 Shape: Palmate
 Portion: Whole
 X-section: Venticular
 Notching: Side and base
 Base: Convex notched
 Blade: Triangular, alternate serrated
 Flaking: Irregular
 Grinding: Absent
 Recycling: Resharpened
 Cultural Association: Frio?
 Temporal Affiliation: Late Archaic
 Dimensions: Length: 27.5 mm
 Haft Width: 15.7 mm
 Maximum Blade Width: 21.3 mm
 Thickness: 5.9 mm
 Comments: May have been more lanceolate prior to resharpening

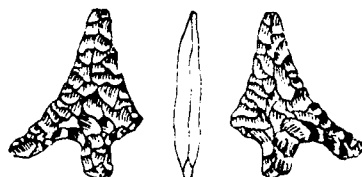


2: LA 54361

Artifact Number: 2
 Artifact Type: Projectile point
 Site Number: LA 54361
 Material: Chert
 Color: White
 Shape: Palmate
 Portion: Whole
 X-section: Plano convex
 Notching: Corner
 Base: Convex
 Blade: Triangular
 Flaking: Convergent
 Grinding: Absent
 Recycling: Resharpened
 Cultural Association: Scallorn
 Temporal Affiliation: Early Ceramic
 Dimensions: Length: 22.2 mm
 Haft Width: 6.8 mm
 Maximum Blade Width: 17.8 mm
 Thickness: 3.9 mm

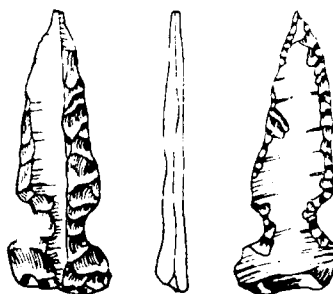
APPENDIX B: Collected Lithic Tools

SCALE 1:1



3: LA 54363

Artifact Number: 3
 Artifact Type: Projectile point
 Site Number: LA 54363
 Material: Chert
 Color: Brown
 Shape: Triangular
 Portion: Tip, one ear missing
 X-section: Lenticular
 Notching: Corner
 Base: Straight
 Blade: Triangular
 Flaking: Convergent
 Grinding: Absent
 Recycling: None
 Cultural Association: Livermore
 Temporal Affiliation: Ceramic
 Dimensions: Length: 23 mm (estimated)
 Haft Width: 3.5 mm
 Maximum Blade Width: 23.7 mm
 Thickness: 3.2 mm
 Comments: Excellent workmanship



4: LA 54363

Artifact Number: 4
 Artifact Type: Projectile point
 Site Number: LA 54363
 Material: Chalcedonic chert
 Color: Gray
 Shape: Elongated triangular
 Portion: Whole
 X-section: Alternate bevel
 Notching: Side
 Base: Irregular
 Blade: Elongated triangular
 Flaking: Alternate microretouch
 Grinding: None
 Recycling: None
 Cultural Association: ?
 Temporal Affiliation: ?
 Dimensions: Length: 39.4 mm
 Haft Width: 6.7 mm
 Maximum Blade Width: 18.7 mm
 Thickness: 2.2 mm
 Comments: Expediently produced; chalcedonic chert commonly used in Paleo Indian projectiles in the vicinity

APPENDIX B: Collected Lithic Tools

SCALE 1:1



5: LA 54366

Artifact Number: 5
 Artifact Type: Projectile point
 Site Number: LA 54366
 Material: Chert
 Color: Gray with strawberry inclusions
 Shape: Lanceolate?
 Portion: Base
 X-section: Plano convex
 Notching: Side
 Base: Straight
 Blade: Absent
 Flaking: Indeterminate
 Grinding: Absent
 Recycling: None
 Cultural Association: Ensor?
 Temporal Affiliation: Late Archaic?
 Dimensions: Length: Indeterminate
 Haft Width: 14.5 mm
 Maximum Blade Width: 19.9 mm
 Thickness: 5.1 mm

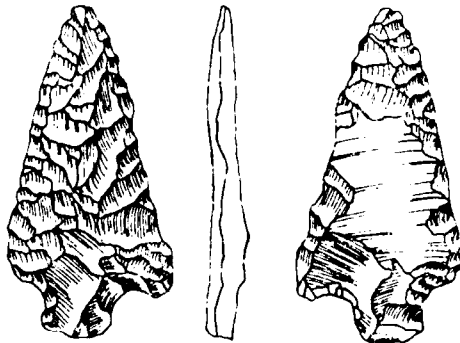


6: LA 54368

Artifact Number: 6
 Artifact Type: Projectile point
 Site Number: LA 54368
 Material: Chert
 Color: Gray
 Shape: Triangular
 Portion: Whole
 X-section: Irregular lenticular
 Notching: Side
 Base: Irregular concave
 Blade: Triangular
 Flaking: Irregular convergent
 Grinding: None
 Recycling: Resharpened
 Cultural Association: Ellis
 Temporal Affiliation: Late Archaic?
 Dimensions: Length: 15.8 mm
 Haft Width: 7.7 mm
 Maximum Blade Width: 19.3 mm
 Width: 7.2 mm
 Comments: Crude workmanship

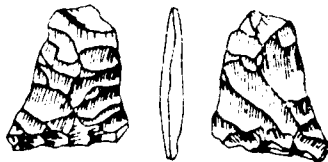
APPENDIX B: Collected Lithic Tools

SCALE 1:1



7: LA 54373

Artifact Number: 7
 Artifact Type: Projectile point
 Site Number: LA 54373
 Material: Chert
 Color: Off-white
 Shape: Elongated triangular
 Portion: Complete
 X-section: Plano convex
 Notching: Corner
 Base: Slightly convex
 Blade: Elongated triangular
 Flaking: Transverse unidirectional
 Grinding: Absent
 Recycling: Resharpener
 Cultural Association: Marshall
 Temporal Affiliation: Unknown
 Dimensions: Length: 45.7 mm
 Haft Width: 8.7 mm
 Maximum Blade Width: 22.6 mm
 Thickness: 3.7 mm
 Comments: Facially flaked on one side

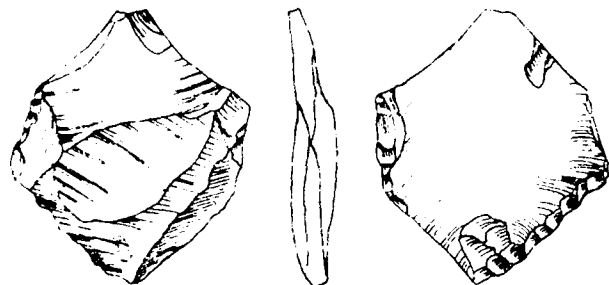


8: LA 54374

Artifact Number: 8
 Artifact Type: Projectile point
 Site Number: LA 54374
 Material: Chert
 Color: Gray
 Shape: Elongated triangular
 Portion: Midsection
 X-section: Lenticular
 Notching: Corner
 Base: Absent
 Blade: Elongated triangular
 Flaking: Parallel transverse/parallel oblique
 Grinding: None
 Recycling: Resharpener
 Cultural Association: Scallorn
 Temporal Affiliation: Early Ceramic
 Dimensions: Length: 25.8 mm (estimated)
 Haft Width: 5.7 mm
 Maximum Blade Width: 3.1 mm
 Thickness: 3.1 mm
 Comments: Tip broken through impact; fine workmanship

APPENDIX B: Collected Lithic Tools

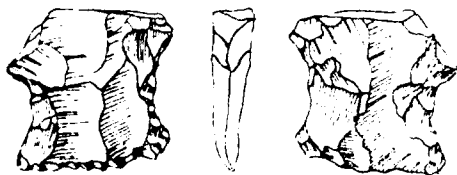
SCALE 1:1



9: LA 54375

Artifact Number: 9
 Artifact Type: Scraper
 Site Number: LA 54375
 Material: Obsidian
 Color: Black
 Shape: Irregular rectangular
 Portion: Two snapped edges
 Working Edge: steep (42 degrees)
 Preparation: Shallow scalar scars
 Use: Steep step fractures and microscalar
 Dimensions: Length: 37.4 mm
 Width: 31.8 mm
 Thickness: 5.8 mm

Comments: Scraper made on a large obsidian biface flake; bug wear on interfloke margins

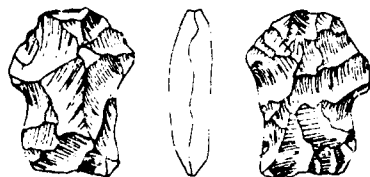


10: LA 54380

Artifact Number: 10
 Artifact Type: Projectile point
 Site Number: LA 54380
 Material: Chert
 Color: Tan
 Shape: Stemmed lanceolate
 Portion: Base
 X-section: Alternate beveled ?
 Notching: Stemmed
 Base: Irregular
 Blade: Absent
 Flaking: Absent
 Grinding: None
 Recycling: Unknown
 Cultural Association: Travis
 Temporal Affiliation: Late Archaic?
 Dimensions: Length: Unknown
 Haft Width: 16.8 mm
 Maximum Blade Width: 22.9 mm
 Thickness: 5.3 mm

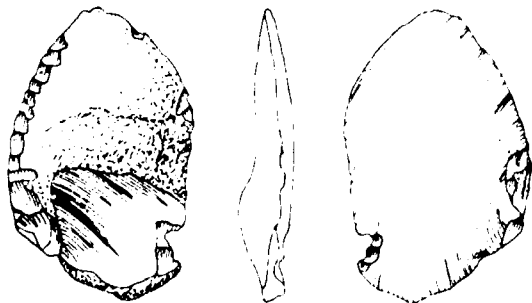
APPENDIX B. Collected Lithic Tools

SCALE 1:1



11: LA 54381

Artifact Number: 11
 Artifact Type: Projectile point
 Site Number: LA 54381
 Material: Chert
 Color: Brown
 Shape: Indeterminate; extensively reworked
 Portion: Tip missing
 X-section: Lenticular
 Notching: stemmed
 Base: Slightly concave
 Blade: Triangular
 Flaking: Irregular convergent
 Grinding: Absent
 Recycling: Extensively resharpened
 Cultural Association: Ellis
 Temporal Affiliation: Late Archaic?
 Dimensions: Length: 25.0 mm (estimated)
 Haft Width: 12.2 mm
 Maximum Blade Width: 17.1 mm
 Thickness: 5.5 mm
 Comments: Original point morphology difficult to determine due to extensive reworking. Flake scars indicate probably stemmed point.



12: LA 54387

Artifact Number: 12
 Artifact Type: Denticulate/notch
 Site Number: LA 54387
 Material: Siltstone
 Color: Dark brown
 Shape: Irregular
 Portion: Whole
 Working Edge: 15 degrees
 Preparation: Serrated edge, unidirectional retouch
 Use: Indeterminate
 Dimensions: Length: 40.1 mm
 Width: 24.8 mm
 Thickness: 5.4 mm
 Comments: Serrated edge on primary flake with notch

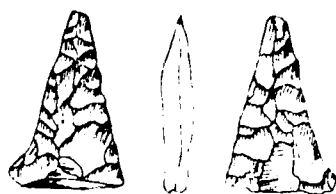
APPENDIX B: Collected Linné Tools

SCALE 1:1



I.O. 10

Isolated Occurrence Number: 10
 Artifact Type: Projectile point
 Material: Chert
 Color: Pinkish gray with strawberry inclusions
 Shape: Palmate
 Portion: Complete except for tip
 X-section: Alternate bevel from reworking
 Notching: Corner
 Base: Convex
 Blade: Triangular, serrated
 Flaking: Convergent
 Grinding: None
 Recycling: Reworked in haft
 Cultural Association: Marshall, BM II
 Temporal Affiliation: Late Archaic?
 Dimensions: Length: 44.5 mm
 Haft Width: 21.8 mm
 Maximum Blade Width: 31.5 mm
 Thickness: 6.5 mm
 Comments: Excellent workmanship, heat treated mottled

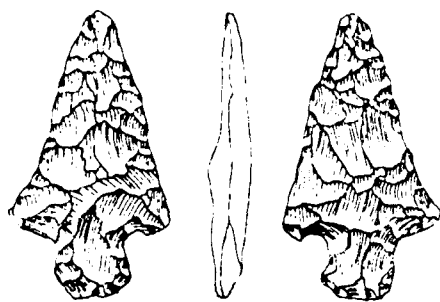


I.O. 30

Isolated Occurrence Number: 30
 Artifact Type: Projectile point
 Material: Chert
 Color: Gray
 Shape: Indeterminate
 Portion: Tip only
 X-section: Lenticular
 Notching: Indeterminate
 Base: Absent
 Blade: Elongated triangular
 Flaking: Parallel transverse
 Grinding: Indeterminate
 Recycling: Resharpened
 Cultural Association: Indeterminate
 Temporal Affiliation: Indeterminate
 Dimensions: Length: Indeterminate
 Haft Width: Absent
 Maximum Blade Width: 14.5 mm
 Thickness: 4.2 mm

APPENDIX B: Collected Lithic Tools

SCALE 1:1



13: LA 54387

Artifact Number: 13
 Artifact Type: Projectile point
 Site Number: LA 54387
 Material: Quartzite
 Color: Gray
 Shape: Elongated triangular
 Portion: Whole
 X-section: Irregular lenticular
 Notching: Corner
 Base: Irregular
 Blade: Elongated triangular
 Flaking: Irregular convergent
 Grinding: None
 Recycling: Extensively reworked in haft
 Cultural Association: Marshall
 Temporal Affiliation: Late Archaic
 Dimensions: Length: 40.2 mm
 Haft Width: 9.3 mm
 Maximum Blade Width: 21.7 mm
 Thickness: 4.8 mm
 Comments: Blade is spiral shaped, pronounced ear



14: LA 54389

Artifact Number: 14
 Artifact Type: Projectile point
 Site Number: LA 54389
 Material: Chert
 Color: Tan
 Shape: Elongated triangular
 Portion: Snapped bottom of base
 X-section: Irregular lenticular
 Notching: Stemmed
 Base: Irregular
 Blade: Triangular
 Flaking: Irregular convergent
 Grinding: None
 Recycling: Extensively reworked
 Cultural Association: Indeterminate - Yarbrough, La Bajada, are possible types
 Temporal Affiliation: Archaic
 Dimensions: Length: 33.9 mm
 Haft Width: 11.9 mm
 Maximum Blade Width: 19.7 mm
 Thickness: 6.8 mm
 Comments: Crude workmanship, impact fracture on tip

APPENDIX B: Collected Lithic Tools

SCALE 1:1



I.O. 45

Isolated Occurrence Number: 45
 Artifact Type: Projectile point
 Material: Chalcedony
 Color: Off-white
 Shape: Triangular
 Portion: Whole
 X-section: Lenticular
 Notching: Corner
 Base: Straight
 Blade: Triangular
 Flaking: Parallel transverse
 Grinding: None
 Recycling: Core resharpening
 Cultural Association: Scallorn
 Temporal Affiliation: Early Ceramic
 Dimensions: Length: 25.4 mm
 Haft Width: 7.1 mm
 Maximum Blade Width: 18.9 mm
 Thickness: 3.8 mm



I.O. 48

Isolated Occurrence Number: 48
 Artifact Type: Projectile point
 Material: Chert
 Color: Off-white
 Shape: Palmate
 Portion: Whole
 X-section: Lenticular
 Notching: Corner
 Base: Concave
 Blade: Triangular, serrated
 Flaking: Convergent
 Grinding: None
 Recycling: Resharpened
 Cultural Association: Marshall
 Temporal Affiliation: Middle to Late Archaic
 Dimensions: Length: 37.6 mm
 Haft Width: 12.9 mm
 Maximum Blade Width: 29.8 mm
 Thickness: 6.5 mm

APPENDIX C:

Lithic Tables

- Appendix C-1: Material Selection by Site
- Appendix C-2: Cores by Site
- Appendix C-3: Thickness by Flake Type
- Appendix C-4: Flake Reduction by Material by Site
- Appendix C-5: Observed and Estimated Artifact Surface
Densities and Counts by Artifact Class
- Appendix C-6: Groundstone by Site

APPENDIX C-1: Material Selection by Site

Material selection by site

| Site No. | Jasper | Limestone/Caliche | Conglomerate | Obsidian | Silicified Wood | Siltstone | Igneous | Sandstone | Silicified Sandstone | Chalcedony | Gray Chert | Brown Chert | White Chert | Red Chert | Yellow Chert | Alibates | Chert Color Na | Total |
|----------|--------|-------------------|--------------|----------|-----------------|-----------|---------|-----------|----------------------|------------|------------|-------------|-------------|-----------|--------------|----------|----------------|-------|
| MA235B-1 | | | | | | | | 1/8 | 1/8 | | 3/25 | 4/33 | 3/25 | | | | | 12 |
| 2 | | | | | | | | 3/50 | | | | 1/17 | | 1/17 | | 1/17 | | 6 |
| 3 | | | | | | | | | | | 1/100 | | | | | | | 1 |
| 4 | | | | | | | | | 2/100 | | | | | | | | | 2 |
| 5 | | | | | 2/40 | | | | | 2/40 | | | 1/20 | | | | | 5 |
| 6 | | 1/4 | | | 1/4 | 1/4 | 1/4 | 4/14 | 2/7 | 1/4 | 6/21 | 5/21 | 4/14 | 1/4 | | | | 28 |
| 7 | 1/1 | 7/8 | | | | | 2/2 | 31/35 | 17/19 | 15/17 | 4/5 | 5/6 | 5/7 | | | | | 88 |
| 8 | | | | | | | | 3/60 | | | 1/20 | | 1/20 | | | | | 5 |
| 9 | | | | | 1/10 | | | | 2/20 | 1/10 | 3/30 | 1/10 | 1/10 | | | | 1/10 | 10 |
| 10 | | | | | 1/4 | 1/4 | | 3/11 | 4/14 | 2/7 | 5/19 | 7/26 | | 1/4 | | | 3/11 | 27 |
| 11 | | 1/5 | | | | | | 1/5 | 2/11 | 1/5 | 4/21 | 8/42 | 2/11 | | | | | 19 |
| 12 | | 1/3 | | | | | 1/3 | 9/28 | 4/13 | 5/16 | 2/6 | 6/19 | 2/6 | 2/6 | | | | 32 |
| 13 | | | | | 3/12 | | | 10/40 | 3/12 | 5/20 | 1/4 | 3/12 | | | | | | 25 |
| 14 | | | | | | | | 1/33 | 1/33 | | | | 1/33 | | | | | 3 |
| 15 | | | | | | | | 2/100 | | | | | | | | | | 2 |
| 16 | | | | | | | | | 1/33 | 1/33 | 1/33 | | | | | | | 3 |
| 17 | | 4/17 | | | | | | 5/21 | 2/8 | 5/21 | 4/17 | 2/8 | | | 1/4 | | 1/4 | 24 |
| 18 | | 1/8 | | | | | | 7/58 | 2/17 | 1/8 | 1/8 | 1/8 | | | | | | 12 |
| 19 | | 1/2 | | 1/2 | 3/7 | 1/2 | | 3/7 | 1/2 | 18/43 | 5/12 | 3/7 | 3/7 | | 3/7 | | | 42 |
| 20 | | 1/10 | | | | | | 4/40 | 3/30 | 1/10 | 1/10 | | | | | | | 10 |
| 21 | | | | | 1/10 | | | 3/30 | 1/10 | | 2/20 | 3/30 | | | | | | 10 |
| 22 | | | | | 1/14 | | | | | 2/29 | 1/14 | | 2/29 | | 1/14 | | | 7 |
| 23 | | | | | | | | 1/50 | 1/50 | | | | | | | | | 2 |
| 24 | | | | | | | | 2/20 | 2/20 | 1/10 | 2/20 | 3/30 | | | | | | 10 |
| 25 | | | | | | | | 3/38 | 1/13 | 1/13 | 1/13 | 1/13 | 1/13 | | | | | 8 |
| 26 | | | | | | | | | | | | | 1/100 | | | | | 1 |
| 27 | | | | | | | | 2/25 | | | | 2/25 | 2/25 | 2/25 | | | | 8 |
| 28 | | | 1/25 | | | | | 1/25 | | | | | 2/50 | | | | | 4 |
| 29 | 1/6 | | | | | | | | 5/31 | 4/25 | 2/13 | 3/19 | | | 1/6 | | | 16 |
| 30 | 1/20 | | | | | | | 1/20 | | 1/20 | 1/20 | | 1/20 | | | | | 5 |
| 31 | | | | | | | 1/13 | 2/25 | 2/25 | 1/13 | 1/13 | | 1/13 | | | | | 8 |
| 33 | | | | | | | | 2/22 | 1/11 | 5/56 | | 1/11 | | | | | | 9 |
| 34 | | | | | | | | 2/40 | | | 3/60 | | | | | | | 5 |
| 35 | | | | | | 2/20 | | | 1/10 | 2/20 | | 1/10 | 2/20 | 2/20 | | | | 10 |
| 36 | | 1/3 | | | | | | 3/9 | 6/18 | 5/15 | 4/12 | 3/9 | 9/27 | 1/3 | | 1/3 | | 33 |
| 37 | | | | | | | | | 1/20 | 1/20 | | 2/40 | 1/20 | | | | | 5 |
| 38 | | | | | | 1/5 | 1/5 | 3/16 | 1/5 | 6/32 | 2/11 | 2/11 | 2/11 | 1/5 | | | | 19 |
| 39 | | | | | | | | 1/25 | | | 1/25 | 2/50 | | | | | | 4 |
| 40 | | | | | | | | 1/13 | | | 2/25 | | 3/38 | | 2/25 | | | 8 |

Total 3/1 18/4 1/0 1/0 13/2 6/1 6/1 107/19 74/14 88/17 64/12 70/14 51/9 11/2 8/2 1/0 6/1 528

APPENDIX C-2: Cores by Site

CORES BY SITE

| Site No. | Flake Potential of Core | | Core Type | | | | | | Use | Total | | | | | |
|----------|----------------------------|---------------------|--------------------|-----------------|----------------|--------|---|-----|-----|-------|---|-----|---------|----|-----|
| | Exhausted | Unidirec- tional | Didirec- tional | Multi- facet | Pyra- midal | Tested | | | | | | | | | |
| | | | | | | | # | % | | | # | % | # | % | # |
| 6 | 1 | 100 | - | - | - | - | 1 | 100 | - | - | - | - | No | 1 | 100 |
| 7 | 1 | 100 | - | - | - | - | 1 | 100 | - | - | - | - | No | 1 | 100 |
| 9 | 1 | 100 | 1 | 100 | - | - | - | - | - | - | - | - | No | 1 | 100 |
| 10 | - | - | - | - | 1 | 100 | - | - | - | - | - | - | No | 1 | 100 |
| 13 | - | - | - | - | - | - | 1 | 100 | - | - | - | - | Yes | 1 | 100 |
| 14 | - | - | 1 | 100 | - | - | - | - | - | - | - | - | Yes | 1 | 100 |
| 19 | - | - | - | - | - | - | - | - | - | - | 1 | 100 | No | 1 | 100 |
| 25 | - | - | - | - | - | - | 3 | 100 | - | - | - | - | Yes | 3 | 100 |
| | | | | | | | | | | | | | (all 3) | | |
| 29 | - | - | 1 | 100 | - | - | - | - | - | - | - | - | No | 1 | 100 |
| 35 | 1 | 100 | - | - | - | - | 1 | 100 | - | - | - | - | No | 1 | 100 |
| Totals | 4 | 33 | 3 | 25 | 1 | 8 | 7 | 58 | - | - | 1 | 8 | | 12 | 100 |

APPENDIX C-3: Thickness by Flake Type

THICKNESS BY FLAKE TYPE FOR SITES WITH N => 10 COMPLETE FLAKES

| | 0<T<=1 | | 1<T<=3 | | 3<T<=6 | | 6<T<=12 | | 12<T | | Total | |
|-------------------------|--------|----|--------|----|--------|----|---------|----|------|----|-------|--------|
| | # | % | # | % | # | % | # | % | # | % | # | Site % |
| <u>Site = MA235B-7</u> | | | | | | | | | | | | |
| Core Flakes | - | | 1 | | 4 | | 2 | | 1 | | 8 | 47 |
| Biface Flakes | 2 | | 3 | | 2 | | 2 | | - | | 9 | 53 |
| Blades | - | | - | | - | | - | | - | | - | - |
| Total | 2 | 12 | 4 | 24 | 6 | 35 | 4 | 24 | 1 | 6 | 17 | 100 |
| <u>Site = MA235B-12</u> | | | | | | | | | | | | |
| Core Flakes | - | | 2 | | 1 | | 2 | | 2 | | 7 | 70 |
| Biface Flakes | 2 | | - | | 1 | | - | | - | | 3 | 30 |
| Blades | - | | - | | - | | - | | - | | - | - |
| Total | 2 | 20 | 2 | 20 | 2 | 20 | 2 | 20 | 2 | 20 | 10 | 100 |
| <u>Site = MA235B-19</u> | | | | | | | | | | | | |
| Core Flakes | - | | 3 | | - | | 3 | | - | | 6 | 40 |
| Biface Flakes | 6 | | 1 | | 1 | | 1 | | - | | 9 | 60 |
| Blades | - | | - | | - | | - | | - | | - | - |
| Total | 6 | 40 | 4 | 27 | 1 | 7 | 4 | 27 | - | 0 | 15 | 100 |
| <u>Site = MA235B-29</u> | | | | | | | | | | | | |
| Core Flakes | - | | 1 | | 1 | | 8 | | - | | 10 | 91 |
| Biface Flakes | - | | 1 | | - | | - | | - | | 1 | 9 |
| Blades | - | | - | | - | | - | | - | | - | - |
| Total | - | - | 2 | 18 | 1 | 9 | 8 | 73 | - | - | 11 | 100 |
| <u>Site = MA235B-36</u> | | | | | | | | | | | | |
| Core Flakes | - | | 6 | | 3 | | 1 | | 1 | | 11 | 69 |
| Biface Flakes | 4 | | 1 | | - | | - | | - | | 5 | 31 |
| Blades | - | | - | | - | | - | | - | | - | - |
| Total | 4 | 25 | 7 | 44 | 3 | 19 | 1 | 6 | 1 | 6 | 16 | 100 |

APPENDIX C-4: Flake Reduction by Material by Site

| Reduction Type | Jasper | | Silicified Wood | | Igneous | | Silicified Sandstone | | Chalcedony | | Gray Chert | | Brown Chert | | White Chert | | Red Chert | | Totals |
|------------------|--------|---|-----------------|---|---------|---|----------------------|------|------------|------|------------|---|-------------|---|-------------|---|-----------|---|--------|
| | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # |
| Site = MA235B-7 | | | | | | | | | | | | | | | | | | | |
| Primary | | | | | | | 1 | | | | | | | | | | | | 1/6 |
| Secondary | | | | | | | 5 | | 2 | | | | | | | | | | 7/44 |
| Tertiary | | | | | 1 | | 1 | | 3 | | | | | | 3 | | | | 8/50 |
| Total | | | | | 1/6 | | 7/44 | | 5/31 | | | | | | 3/19 | | | | 16/100 |
| Site = MA235B-12 | | | | | | | | | | | | | | | | | | | |
| Primary | | | | | | | 2 | | | | | | | | | | | | 2/20 |
| Secondary | | | | | 1 | | 1 | | 1 | | 1 | | | | | | 1 | | 5/50 |
| Tertiary | | | | | | | | | | | 1 | | 2 | | | | | | 3/30 |
| Total | | | | | 1/10 | | 3/30 | | 1/10 | | 2/20 | | 2/20 | | | | 1/10 | | 10/100 |
| Site = MA235B-19 | | | | | | | | | | | | | | | | | | | |
| Primary | | | | | | | | | 1 | | | | | | | | | | 1/7 |
| Secondary | | | | | | | | 1 | 2 | | 1 | | | | | | 1 | | 5/33 |
| Tertiary | | | 1 | | | | | 2 | 4 | | 1 | | 1 | | | | | | 9/60 |
| Total | | | 1/7 | | | | | 3/20 | 7/47 | | 2/13 | | 1/7 | | | | 1/7 | | 15/100 |
| Site = MA235-29 | | | | | | | | | | | | | | | | | | | |
| Primary | | | | | | | | | | | | | | | | | | | |
| Secondary | 1 | | | | | | 3 | | 3 | | 2 | | | | | | 1 | | 10/91 |
| Tertiary | | | | | | | | | 1 | | | | | | | | | | 1/9 |
| Total | 1/9 | | | | | | 3/27 | | 4/36 | | 2/18 | | | | | | 1/9 | | 11/100 |
| Site = MA235B-36 | | | | | | | | | | | | | | | | | | | |
| Primary | | | | | | | 2 | | | 2 | 2* | | | | | | | | 6/33 |
| Secondary | | | | | | | | | 3 | | | | | 3 | | | 1* | | 7/39 |
| Tertiary | | | | | | | | | 1 | 1 | | | | 3 | | | | | 5/28 |
| Total | | | | | | | 2/11 | | 1/22 | 3/17 | 2/11 | | 6/33 | | 1/6 | | | | 18/100 |

*Includes one bipolar flake

APPENDIX C-5 Observed and Estimated Artifact Surface Densities and Counts
By Artifact Class

OBSERVED AND ESTIMATED ARTIFACT SURFACE DENSITIES AND COUNTS BY ARTIFACT CLASS

| MA | Site No. | Site Area | Sample Fraction | Ground | | | | Ceramics | Metal | Glass | Total Items / Site | Comments |
|----|----------|-----------|-----------------|-----------|---------------|-------------|-----------|-----------|-----------|-----------|--------------------|---------------------------|
| | | | | Debitage | Chipped Stone | Stone Tools | Tot. x/m2 | | | | | |
| | | | | Tot. x/m2 | Tot. x/m2 | Tot. x/m2 | Tot. x/m2 | Tot. x/m2 | Tot. x/m2 | Tot. x/m2 | | |
| 1 | 5000 | 1.0 | 1.0 | 10 .0020 | 1 .0002 | 1 .0002 | 2 .0002 | 2 .0004 | - | - | 14 .0030 | |
| 2 | 400 | 1.0 | 1.0 | 3 .0000 | - | 3 .0000 | 1 .0000 | 1 .0000 | - | - | 6 .0050 | |
| 3 | 800 | 1.0 | 1.0 | 1 .0010 | - | - | 1 .0010 | 1 .0010 | - | - | 2 .0030 | |
| 4 | 2625 | 1.0 | 1.0 | 1 .0020 | 1 .0004 | - | 5 .0020 | 5 .0020 | - | - | 7 .0030 | |
| 5 | 2200 | 1.0 | 1.0 | 3 .0010 | 2 .0009 | - | - | - | - | - | 5 .0020 | |
| 6 | 16000 | 1.0 | 1.0 | 21 .0010 | 2 .0001 | 5 .0005 | 8 .0005 | 8 .0005 | - | - | 36 .0020 | |
| 7 | 330000 | 0.25 | 0.25 | 49 .0049 | 5 .0005 | 34 .0034 | 25 .0025 | 25 .0025 | - | - | 113 .0117 | 100% sample of 2 blowouts |
| 8 | 432 | 1.0 | 1.0 | 2 .0050 | - | 3 .0070 | 1 .0020 | 1 .0020 | - | - | 6 .0120 | |
| 9 | 1200 | 1.0 | 1.0 | 9 .0020 | 1 .0008 | - | - | - | - | - | 10 .0050 | |
| 10 | 14400 | 1.0 | 1.0 | 18 .0010 | 6 .0001 | 3 .0002 | - | 2 .0001 | - | - | 21 .0021 | |
| 11 | 11700 | 1.0 | 1.0 | 17 .0010 | 1 .0001 | 1 .0001 | 2 .0002 | 2 .0002 | - | - | 21 .0020 | |
| 12 | 54000 | 0.15 | 0.15 | 22 .0003 | 1 .0001 | 9 .0011 | 5 .0006 | 5 .0006 | - | - | 37 .0045 | 100% sample of 3 loci |
| 13 | 5625 | 1.0 | 1.0 | 14 .0000 | 2 .0004 | 11 .0002 | 5 .0002 | 5 .0002 | - | - | 32 .0060 | |
| 14 | 1760 | 1.0 | 1.0 | 1 .0005 | 1 .0005 | 1 .0006 | - | - | - | - | 3 .0027 | |
| 15 | 140 | 1.0 | 1.0 | - | - | 2 .00 | - | - | - | - | 2 .0000 | |
| 16 | 1300 | 1.0 | 1.0 | 2 .0000 | 1 .0000 | - | - | - | - | - | 3 .0020 | |
| 17 | 5400 | 1.0 | 1.0 | 16 .0007 | 3 .0000 | 5 .0009 | 4 .0007 | 4 .0007 | - | - | 25 .0030 | |
| 18 | 3500 | 1.0 | 1.0 | 4 .0000 | 3 .0001 | 5 .0010 | 4 .0010 | 4 .0010 | - | - | 16 .0050 | |
| 19 | 80000 | 1.0 | 1.0 | 26 .0000 | 3 .0001 | 3 .0001 | 2 .0001 | 2 .0001 | - | - | 41 .0001 | |
| 20 | 5000 | 1.0 | 1.0 | 5 .0000 | - | 5 .0010 | 2 .0010 | 2 .0010 | - | - | 7 .0020 | |

APPENDIX C-5 (continued)

DETECTED AND ESTIMATED ARTIFACT SURFACE DENSITIES AND COUNTS BY ARTIFACT CLASS continued

| Site No. | Area | Sample Fraction | Ground | | | | | | Total Items / Site | Comments |
|----------|-------|-----------------|-----------|---------------|-------------|-----------|-----------|-----------|--------------------|---------------------|
| | | | Debitage | Chipped Stone | Stone Tools | Ceramics | Metal | Glass | | |
| | | | Tot. x/m2 | Tot. x/m2 | Tot. x/m2 | Tot. x/m2 | Tot. x/m2 | Tot. x/m2 | | |
| 21 | 4592 | 1.0 | 7 .0020 | - | 3 .0001 | 1 .0002 | - | - | 11 .0020 | |
| 22 | 3200 | 1.0 | 7 .0020 | - | - | - | 1 .0003 | - | 7 .0020 | |
| 23 | 6000 | 1.0 | 1 .0002 | - | 1 .0002 | - | - | - | 2 .0003 | |
| 24 | 2816 | 1.0 | 4 .0010 | 4 .0000 | 2 .0001 | - | - | - | 10 .0010 | |
| 25 | 8250 | 1.0 | 1 .0001 | 4 .0000 | 3 .0001 | - | - | - | 8 .0010 | |
| 26 | 2952 | 1.0 | 1 .0003 | - | - | - | - | - | 1 .0003 | |
| 27 | 1152 | 1.0 | 6 .0050 | - | 2 .0001 | - | - | - | 8 .0050 | |
| 28 | 440 | 1.0 | 1 .0003 | 2 .0001 | 1 .0001 | - | - | - | 4 .0005 | |
| 29 | 9000 | 1.0 | 15 .0020 | 1 .0000 | - | - | - | - | 16 .0020 | |
| 30 | 924 | 1.0 | 4 .0040 | - | 1 .0001 | - | - | - | 5 .0040 | |
| 31 | 1072 | 1.0 | 4 .0030 | 1 .0001 | 1 .0001 | - | - | - | 6 .0030 | |
| 32 | 800 | 1.0 | - | - | - | 2 .0001 | - | - | 2 .0001 | |
| 33 | 2800 | 1.0 | 5 .0002 | 1 .0001 | 2 .0001 | - | - | - | 9 .0004 | |
| 34 | 12000 | 0.05 | 3 .0005 | - | 2 .0003 | 5 .0008 | - | - | 10 .0016 | 10% sample of 10000 |
| 35 | 1000 | 1.0 | 9 .0050 | 1 .0001 | - | - | - | - | 10 .0050 | |
| 36 | 1512 | 1.0 | 24 .0001 | 1 .0001 | 4 .0050 | - | - | - | 33 .0050 | |
| 37 | 240 | 1.0 | 5 .0002 | - | - | - | - | - | 5 .0002 | |
| 38 | 5250 | 1.0 | 11 .0020 | 5 .0000 | 3 .0006 | 2 .0004 | - | - | 21 .0020 | |
| 39 | 2200 | 1.0 | 1 .0005 | 1 .0001 | 1 .0005 | - | - | - | 4 .0010 | |
| 40 | 100 | 1.0 | 7 .0002 | - | 1 .0001 | - | - | - | 8 .0002 | |

APPENDIX C-b: Groundstone by Site

| MA/LA Site Number | Artifact Type | Material Type | Portion | Condition | Overall Shape | Morphology | Gross Section |
|-------------------------|---------------|------------------|----------|-----------|------------------|------------|---------------|
| 1/54357 | Metate | Coarse Sandstone | Fragment | -- | Slab | -- | -- |
| 2/54358 | Metate | Sandstone | Fragment | -- | -- | -- | -- |
| | Metate | Sandstone | Fragment | -- | -- | -- | -- |
| | Metate | Sandstone | Fragment | -- | -- | -- | -- |
| 6/54362 | Metate | Sandstone | Fragment | Burned | Slab | -- | -- |
| | Mano | Sandstone | Fragment | -- | -- | Unifacial | -- |
| | Mano | Caliche | Complete | Excellent | 1-Hand | Bifacial | -- |
| | Metate | Sandstone | Fragment | Burned | Slab | -- | -- |
| | Metate | Sandstone | Fragment | Burned | Slab | -- | -- |
| 7/54363 | Unknown | Fine Sandstone | Fragment | -- | -- | Unifacial | Plano |
| | Unknown | Fine Sandstone | Fragment | -- | -- | Unifacial | Plano |
| | Metate | Fine Sandstone | Fragment | -- | Basin | Unifacial | Concave |
| | Mano | Fine Sandstone | Fragment | -- | Unknown | Unifacial | Convex |
| | Mano | Fine Sandstone | Fragment | -- | -- | Unifacial | Convex |
| | Unknown | Fine Sandstone | Fragment | -- | -- | Unifacial | Plano |
| | Metate | Fine Sandstone | Fragment | -- | -- | Unifacial | Concave |
| | Mano | Fine Sandstone | Fragment | -- | -- | Unifacial | Convex |
| | Unknown | Fine Sandstone | Fragment | -- | -- | Unifacial | Plano |
| | Mano | Fine Caliche | Fragment | -- | -- | Unifacial | Plano |
| | Mano | Fine Sandstone | Complete | -- | -- | Unifacial | Convex |
| | Metate | Fine Caliche | Fragment | -- | Slab | Unifacial | Plano |
| | Mano | Fine Sandstone | Fragment | -- | -- | Bifacial | Plano |
| | Mano | Fine Sandstone | Fragment | -- | -- | Unifacial | Convex |
| | Metate | Fine Sandstone | Fragment | -- | -- | Unifacial | Plano |
| | Mano | Fine Sandstone | Fragment | -- | -- | Unifacial | Convex |
| | Unknown | Fine Sandstone | Fragment | -- | -- | Unifacial | Plano |
| | Unknown | Fine Sandstone | Fragment | -- | -- | Unifacial | Plano |
| | Unknown | Fine Sandstone | Fragment | -- | -- | Unifacial | Plano |
| | Metate | Fine Sandstone | Fragment | -- | -- | Unifacial | Concave |
| | Mano | Medium Sandstone | Fragment | -- | -- | Unifacial | Plano |
| | Metate | Fine Sandstone | Fragment | -- | -- | Unifacial | Concave |
| | Mano | Fine Sandstone | Fragment | -- | Wedge | Bifacial | Biplano |
| | Unknown | Fine Sandstone | Fragment | -- | -- | Unifacial | Plano |
| | Mano | Fine Sandstone | Fragment | -- | Wedge | Bifacial | Biplano |
| | Mano | Fine Sandstone | Fragment | -- | -- | Bifacial | Biplano |
| | Metate | Fine Sandstone | Fragment | -- | Basin | Unifacial | Concave |
| | Mano | Fine Sandstone | Fragment | -- | Wedge | Bifacial | Biconvex |
| | Unknown | Fine Sandstone | Fragment | -- | -- | Unifacial | Plano |
| | Metate | Fine Sandstone | Fragment | -- | Slab | Unifacial | Plano |
| | Metate | Fine Sandstone | Fragment | -- | Slab | Unifacial | Plano |
| | Metate | Fine Sandstone | Fragment | -- | Slab | Unifacial | Plano |
| | Mano | Fine Caliche | Fragment | -- | -- | Bifacial | Biplano |
| | Metate | Fine Sandstone | Fragment | -- | Basin | Unifacial | Concave |
| 8/54364 | Metate | Sandstone | Fragment | Excellent | -- | -- | -- |
| | Metate | Sandstone | Fragment | Excellent | -- | -- | -- |
| | Metate | Sandstone | Fragment | Burned | -- | -- | -- |

APPENDIX C-6: (continued)

| MA/LA Site Number | Artifact Type | Material Type | Portion | Condition | Overall Shape | Morphology | Cross Section |
|-------------------------|---------------|------------------|----------|----------------|------------------|------------|--------------------|
| 10/54366 | Metate | Sandstone | Fragment | Burned | Slab | -- | -- |
| | Metate | Sandstone | Complete | Excellent | Slab | -- | -- |
| | Mano | Sandstone | Fragment | -- | Wedge | -- | -- |
| 11/54367 | Mano | Coarse Sandstone | Fragment | Eroded | -- | -- | -- |
| 12/54368 | Mano | Fine Sandstone | Fragment | -- | Wedge | Bifacial | Biconvex |
| | Mano | Fine Sandstone | Fragment | -- | Wedge | Bifacial | Biplano |
| | Mano | Fine Sandstone | Complete | -- | -- | -- | -- |
| | Metate | Fine Sandstone | Fragment | -- | -- | Bifacial | Concave/Plano |
| | | Fine Sandstone | Fragment | -- | -- | Bifacial | Plano/Plano |
| | Mano | Fine Sandstone | Fragment | -- | -- | Bifacial | Plano/Convex |
| | Mano | Fine Sandstone | Fragment | -- | -- | Bifacial | Biconvex |
| | Mano | Fine Sandstone | Fragment | -- | -- | Unifacial | Plano |
| | Metate | Fine Sandstone | Fragment | -- | -- | Unifacial | Concave |
| 13/54369 | Mano | Medium Sandstone | Fragment | -- | -- | Unifacial | -- |
| | Mano | Medium Sandstone | Fragment | -- | Wedge | Bifacial | Plano/Convex |
| | Metate | Fine Sandstone | Fragment | Burned | -- | -- | -- |
| | Mano | Fine Sandstone | -- | -- | -- | -- | -- |
| | Mano | Medium Sandstone | -- | -- | -- | -- | -- |
| | Mano | Coarse Sandstone | -- | -- | -- | -- | -- |
| | Unknown | Coarse Sandstone | -- | -- | -- | -- | -- |
| | Unknown | Fine Sandstone | -- | -- | -- | -- | -- |
| | Mano | -- | Fragment | Fire-Cracked | Wedge | -- | -- |
| | Metate | -- | Fragment | Pecked, Eroded | Basin | -- | -- |
| 14/54370 | Metate | -- | Fragment | -- | -- | -- | -- |
| 15/54371 | Metate | Fine Sandstone | Complete | -- | Basin | -- | -- |
| | Mano | Fine Sandstone | Fragment | -- | One-Hand | -- | -- |
| 17/54373 | Mano | Medium Sandstone | Fragment | -- | -- | -- | -- |
| | Mano | Medium Sandstone | Complete | -- | One-Hand, Wedge | -- | Plano/Convex |
| | Mano | Fine Sandstone | Complete | -- | One-Hand, Wedge | -- | Biplano |
| | Mano | Fine Sandstone | Fragment | -- | -- | -- | Plano/? |
| | Mano | Fine Sandstone | Fragment | -- | One-Hand | Unifacial | Plano |
| 18/54374 | Metate | Fine Quartzite | Complete | -- | One-Hand | Unifacial | Concave |
| | Mano | Fine Quartzite | Complete | -- | One-Hand | Unifacial | Convex |
| | Metate | Fine Quartzite | Fragment | -- | One-Hand | Unifacial | Concave |
| | Unknown | Fine Quartzite | Fragment | -- | -- | -- | -- |
| | Mano | Fine Quartzite | Fragment | -- | One-Hand | Bifacial | Biplano |
| 19/54375 | Metate | Fine Sandstone | Fragment | -- | Basin | Unifacial | Concave |
| | Metate | Medium Sandstone | Fragment | -- | One-Hand | Unifacial | Convex/ Concave |
| | Mano | Fine Sandstone | Fragment | -- | One-Hand, Wedge | -- | Biplano |
| 20/54376 | Mano | Fine Sandstone | Complete | -- | -- | Unifacial | Plano |
| | Mano | Fine Sandstone | Fragment | -- | -- | Unifacial | -- |
| | Mano | Medium Caliche | Complete | -- | -- | Unifacial | Convex |
| | Mano | Medium Sandstone | Fragment | -- | -- | Unifacial | Convex |
| | Mano | Medium Sandstone | Complete | -- | -- | Unifacial | Convex |

APPENDIX C-6: (continued)

| MA/LA Site Number | Artifact Type | Material Type | Portion | Condition | Overall Shape | Morphology | Cross Section |
|-------------------------|---------------|------------------|----------|-----------------------|------------------|------------|---------------|
| 21/54377 | Pestle | Fine Sandstone | Complete | -- | -- | Bifacial | Biconvex |
| | Mano | Fine Sandstone | Fragment | -- | Wedge | Bifacial | Biplano |
| | Metate | Medium Sandstone | Fragment | -- | -- | Unifacial | Concave |
| 23/54379 | Mano | Fine Sandstone | Fragment | Burned | -- | Unifacial | Convex |
| 24/54380 | Mano | Fine Sandstone | Fragment | -- | -- | Unifacial | Plano |
| | Unknown | Fine Sandstone | Fragment | Eroded | -- | -- | -- |
| 25/54381 | Metate | -- | Fragment | Recycled | One-Hand | -- | -- |
| | Mano | -- | -- | -- | Wedge | -- | -- |
| 27/54383 | Mano | Medium Sandstone | Fragment | -- | One-Hand | Bifacial | Plano/Plano |
| | Metate | Fine Sandstone | Complete | -- | Basin | Unifacial | Convex |
| 28/54384 | Mano | Coarse Sandstone | Complete | -- | -- | Unifacial | Plano |
| 31/54387 | Metate | Fine Sandstone | Fragment | -- | Basin | Unifacial | Convex |
| 32/54388 | Mano | Fine Sandstone | Complete | -- | Wedge | Bifacial | Biplano |
| 33/54389 | Metate | Medium Sandstone | Complete | -- | Slab | Unifacial | Plano |
| | Metate | Medium Sandstone | Fragment | -- | Slab | Unifacial | Plano |
| 34/54390 | Unknown | Fine Sandstone | Fragment | -- | -- | Bifacial | Plano |
| | Mano | Fine Sandstone | Complete | -- | -- | Bifacial | Plano/Convex |
| 36/54392 | Metate | Sandstone | Fragment | Wafer Thin | -- | -- | -- |
| | Mano | Sandstone | Fragment | -- | -- | -- | -- |
| | Mano | Sandstone | Fragment | -- | -- | Bifacial | -- |
| | Mano | Caliche | Complete | -- | -- | -- | -- |
| 38/54394 | Metate | Sandstone | Fragment | -- | -- | -- | -- |
| | Metate | Sandstone | Fragment | Burned | -- | -- | -- |
| | Metate | Sandstone | Fragment | Burned | -- | -- | -- |
| 39/54395 | Metate | Sandstone | Fragment | Burned | Slab | -- | -- |
| 40/54396 | Metate | Sandstone | Fragment | Wafer Thin, Burned | -- | -- | -- |

APPENDIX D:

Flotation and Charcoal Analyses from Two Small Sites

FLOTATION AND CHARCOAL ANALYSES FROM TWO SMALL SITES
(LA 54385 AND 54388)
NEAR CARLSBAD, SOUTHEASTERN NEW MEXICO

Submitted to:

Amy Earls
Mariah Associates, Inc.
2825-C Broadbent Parkway
Albuquerque, New Mexico 87107

Submitted by:

Mollie S. Toll
Castetter Laboratory for Ethnobotanical Studies
Department of Biology
University of New Mexico
Albuquerque, New Mexico 87131

April 21, 1987

Botanical samples were processed from two small sites near the Los Medanos Waste Isolation Pilot Plant (WIPP) with the hope of isolating food or fuel elements used prehistorically, and of illuminating feature and/or site function. Materials reviewed here include seeds and other specimens collected from three flotation samples, and charcoal. Fragmentary charcoal was identified as to taxon before it was submitted for carbon-14 dating.

The archaeological sites involved are located at the northern end of the Chihuahuan Desert, which extends from southern Zacatecas, Mexico, north into southwestern Texas, central New Mexico, and southeastern Arizona, chiefly at elevations below 1370 m (4500 feet). Some major north-south trending mountain ranges are part of the Chihuahuan Desert, but in this northern extension the principal geomorphic features are broad tablelands, bajadas, and valley floors. Principal vegetation patterns are grasslands or shrub-grasslands. Creosotebush (Larrea tridentata), tar bush (Flourensia cernua), and acacias (Acacia constricta, A. greggii) occur on dry plains and slopes at 914 to 1370 m (3000 to 4500 feet) elevation, while mesquite (Prosopis spp.) is found mostly on dunes or along gravelly washes, and lechuguilla (Agave lechuguilla) on limestone soils (Martin 1980). Wheeler's sotol (Dasylirion wheeleri), graythorn and squawbush (Condalia lycoides, C. spathulata), palmilla (Yucca elata), ocotillo (Fouquieria splendens), and several cacti (Echinocactus spp., Opuntia spp.) are found on dry rocky slopes and mesas.

The three soil samples collected during excavation were processed at Mariah Associates, Inc. by the simplified "bucket" version of flotation (see Bohrer and Adams 1977). Each one liter sample was immersed in a bucket of water, and a 30-40 second interval allowed for settling out of heavy particles. The solution was then poured through a fine screen (about 0.35 mm mesh) lined with a square of "chiffon" fabric, catching organic materials floating or in suspension. The fabric was lifted out and laid flat until the recovered material had dried. Each sample was sorted using a series of nested geological screens (4.0, 2.0, 1.0, 0.5 mm mesh), and then reviewed under a binocular microscope at 7-45x. From the charcoal samples collected for carbon-14 dating, each piece of charcoal was snapped to expose a fresh transverse section, and identified at 45x.

LA 543885

This possible PaleoIndian site was located approximately 3.2 km (2 miles) southeast of Livingston Ridge, and consisted chiefly of scattered mineralized bone and lithic artifacts on the surface of a large stabilized blowout. The single flotation sample derived from the remains of a burn feature (a circular charcoal stain 53 cm in diameter). A rodent hole filled with sterile sand was present on the north side of the feature. Floral materials included only representatives of the modern vegetative community (pristine seeds of two small annual weeds, spurge and carpetweed).

LA 54388

This Early Ceramic site contained Jornada brownware sherds along with seven pits. The site was located northeast of Los Medanos, about 4.8 km (3 miles) east-northeast of the James Ranch. Six C-14 dates for the site produced a corrected, weighted average of A.D. 950 for site occupation. One of the ash pits (Feature 1) contained only modern seeds (carpetweed, purslane, and dropseed grass), while the other (Feature 2) contained the only carbonized plant materials in either site. After considerable exploration, this material remains unidentifiable. The 204 fragments are most likely seed coat fragments of a perennial species. The distinctive morphology (pronounced papillae or tuberculae on a concave or flattened surface) should allow a clear match, but a review of specimens of the perennial species of the area has produced no candidates. The material is relatively heavy (ca. 1.5 - 1.8 mm thick) but all specimens are fragmentary.

All charcoal from this site was identified as mesquite. This unusually uniform pattern is consistent with archaeologists' interpretation of the features as single-use hearths.

SUMMARY

Botanical materials retrieved at two shallow and eroded archaeological sites in southeastern New Mexico as yet provide no information about food materials processed or consumed prehistorically. Most seeds were pristine and relate to the current flora in the immediate site environs. Carbonized

materials from Feature 2 at LA 54388 associate remains of some perennial fruit or nut with the Early Ceramic occupation, but identification of the material as yet eludes me. All charcoal from the latter site was mesquite; this dense wood represents a good resource selection for either fuel or tool manufacture.

Table 1 Flotation Results, LA 54385 and 54388.

| Processed sample weight in grams | LA 54385 <u>Feature 1</u> 1.3 g | LA 54388 <u>Feature 1</u> 2.0 g | LA 54388 <u>Feature 2</u> 21.5 g |
|-------------------------------------|---------------------------------------|---------------------------------------|--|
| <u>Euphorbia</u> sp. Spurge | 10 | | |
| <u>Molluga</u> sp. Carpetweed | 15 | 1 | |
| <u>Portulaca</u> sp. Purslane | | 1 | |
| <u>Sporobolus</u> sp. Dropseed | | 1 | |
| Unknown | | | [204] |
| TOTAL Seeds: | 25 | 3 | 0 |
| Total taxa | 2 | 3 | 1 |
| Total taxa burned | 0 | 0 | 1 |

REFERENCES CITED

- Bohrer, Vorsila L., and Karen R. Adams. 1977. Ethnobotanical techniques and approaches at the Salmon Ruin, New Mexico. San Juan Valley Archaeological Project, Technical Series 2; Eastern New Mexico University Contributions in Anthropology 8(1).
- Martin, William C. 1980. Floristics of the Los Medanos WIPP study area. Ch. 3 in A report of biological investigations at the Los Medanos Waste Isolation Pilot Plant (WIPP) area of New Mexico during GY1978, edited by Troy L. Best and Sieglinde Neuhauser. Sandia National Laboratories, Albuquerque.

END

DATE

FILMED

8-88

DTIC